

The MINING CONGRESS JOURNAL

Volume 10

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No. 10

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Governmental Relation to Business
Intelligent Law-Making and Income Tax

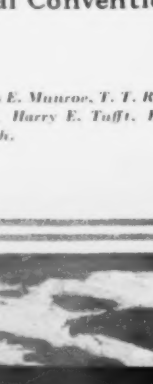
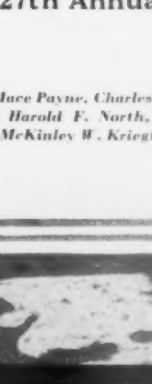
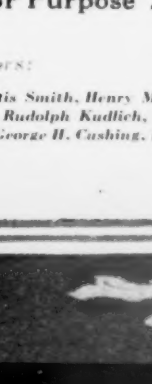
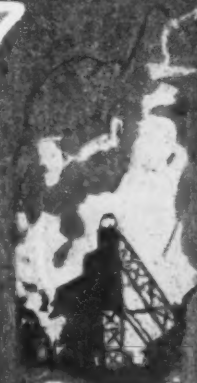
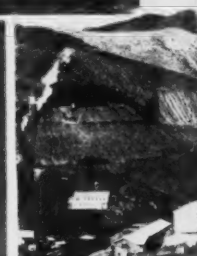
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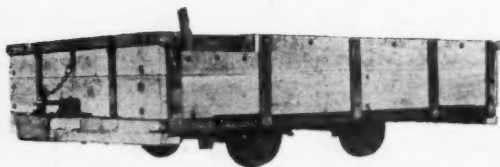
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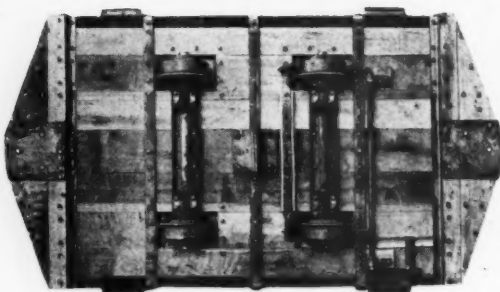
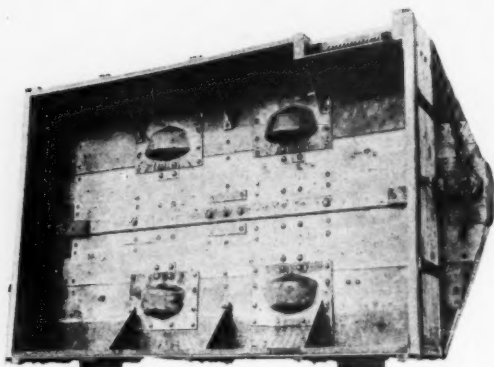
Contributors:

George Otis Smith, Henry Mace Payne, Charles E. Munroe, T. T. Read, J. B. Johnson, Rudolph Kudlich, Harold F. North, Harry E. Tuft, Harvey T. Gracely, George H. Cushing, McKinley W. Krieger.





The Brains Back of the Cars



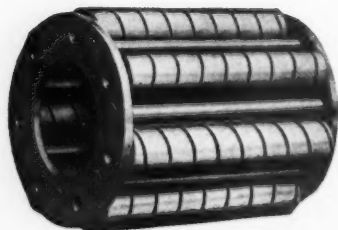
MODERN mine haulage is not based on guesswork. The knowledge and experience of the best engineering brains, both of the mining companies and of the mine car manufacturers, are built into the new types of cars.

These cars are built to haul coal at a lower cost per ton. It is realized that unless haulage economies are maintained the small operating profits available will be dissipated in losses due to friction, high grease and labor costs, and decreased production.

Hyatt bearings are an important factor in modern mine car design. Their sturdiness and easy turning make possible these necessary economies.

The majority of leading mine car manufacturers urge the use of their standard Hyatt equipped running gear as the best solution of the haulage problem.

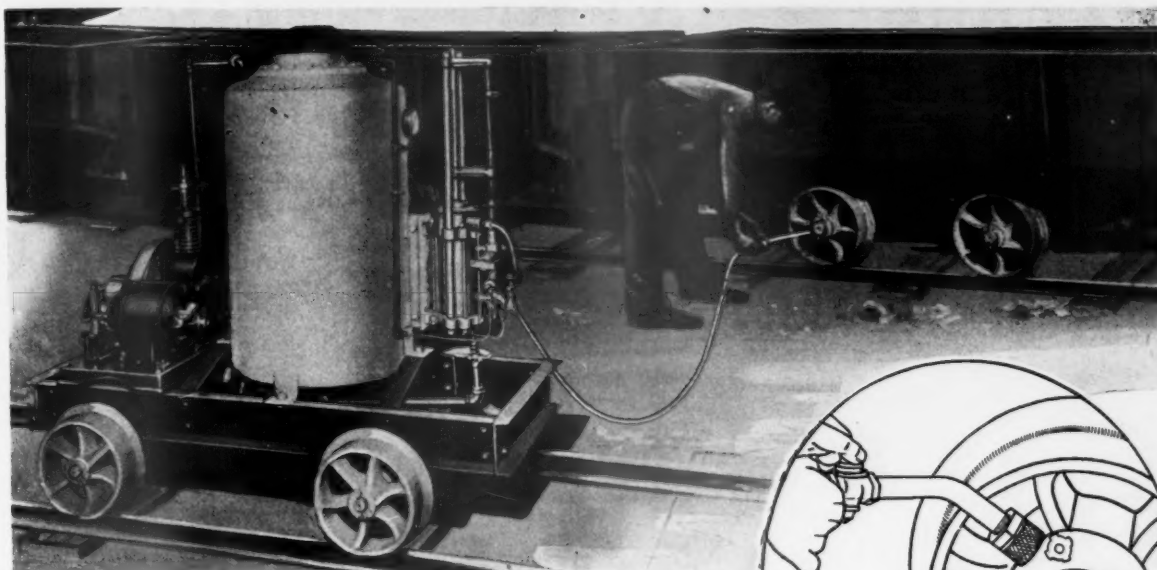
Our new mine car bulletin No. 390 shows the Hyatt equipped wheel designs of twenty-seven mine car manufacturers. Write for a copy.



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HYATT ROLLER BEARINGS FOR MINE CARS



THE LINCOLN GREASING SYSTEM FOR MINE CARS

The Lincoln Greasing System is a mechanical method for greasing mine cars. A single operation automatically measures a predetermined amount of grease to go into a wheel or box and then forces the grease into that wheel or box under pressure.



Lincoln Self-Closing Spring Oilers (Fig. 1), are furnished as a part of the Lincoln Greasing System, for all types and makes of mine car trucks to replace present

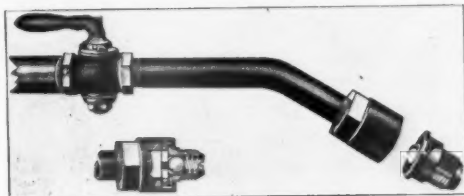


Fig. 2

plugs or oilers no matter where located. In combination with the Lincoln Coupler Nozzle (attached to hose line of greasing unit in place of ordinary nozzle) an absolutely leakproof and quickly detachable connection is provided.

The Lincoln Automatic Greasing Machine may be connected with your present air line or used with motor compressor unit, and is entirely automatic in operation.

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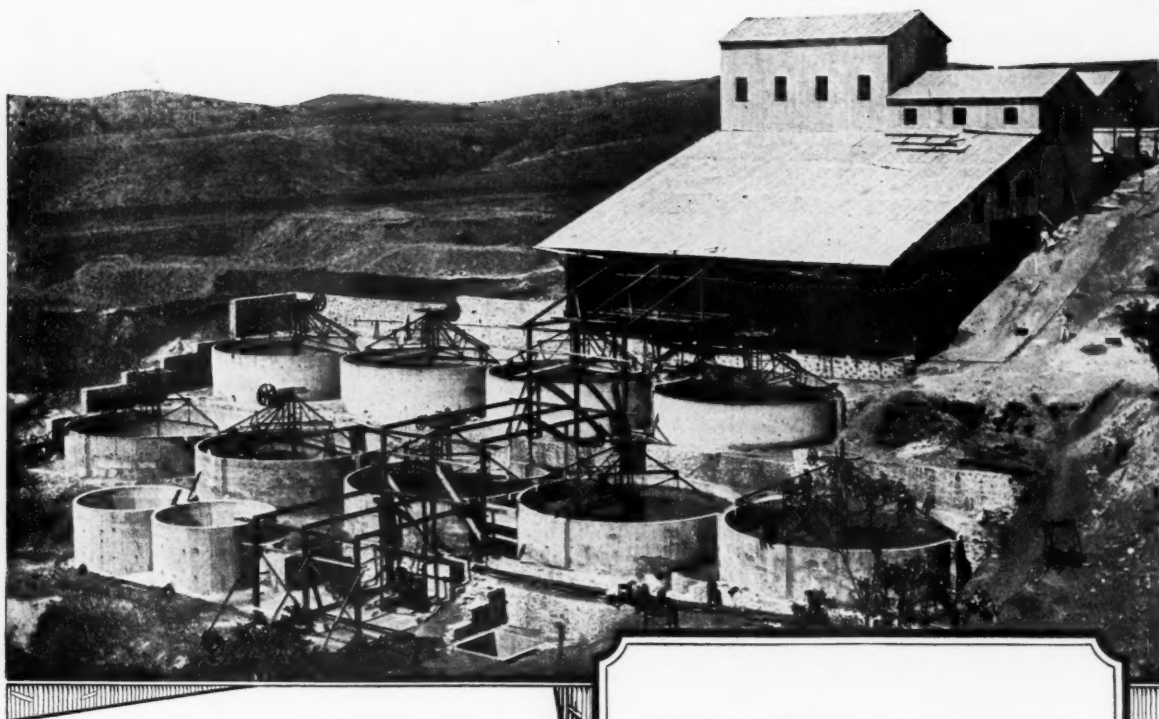
The *indirect saving* in having your cars positively and properly greased is even greater—for this means fewer repair parts and longer life for your car equipment.

Complete information and quotation on request. In writing please advise number of cars in service, number of each make or type, if possible, and how often you now grease your cars. Also state if you have air supply and whether A. C. or D. C. current is available.

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Where the Aztecs Worked Their Fabulous Silver Mines

IN MEXICO, where centuries ago the Aztecs drove their slaves, are now situated some of the most modern and efficient silver mines.

The Aztecs, conquerors of this most picturesque mining district in the world, were famed for their terrible human sacrifice; but they were able, without the aid of explosives or mechanical apparatus, to sink shafts as deep as 2,000 feet.

Today, however, this section is the seat of many mining plants, worked with an economy of effort and cost. The foregoing photograph and letter describe how, in this work, entirely satisfactory results are obtained from the use of Aero Brand Cyanide in the up-to-date cyanide plant.

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 511 Fifth Avenue New York

Aero Brand Cyanide

THE MINING CONGRESS JOURNAL

OCTOBER, 1924

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\$3.00 Per Year
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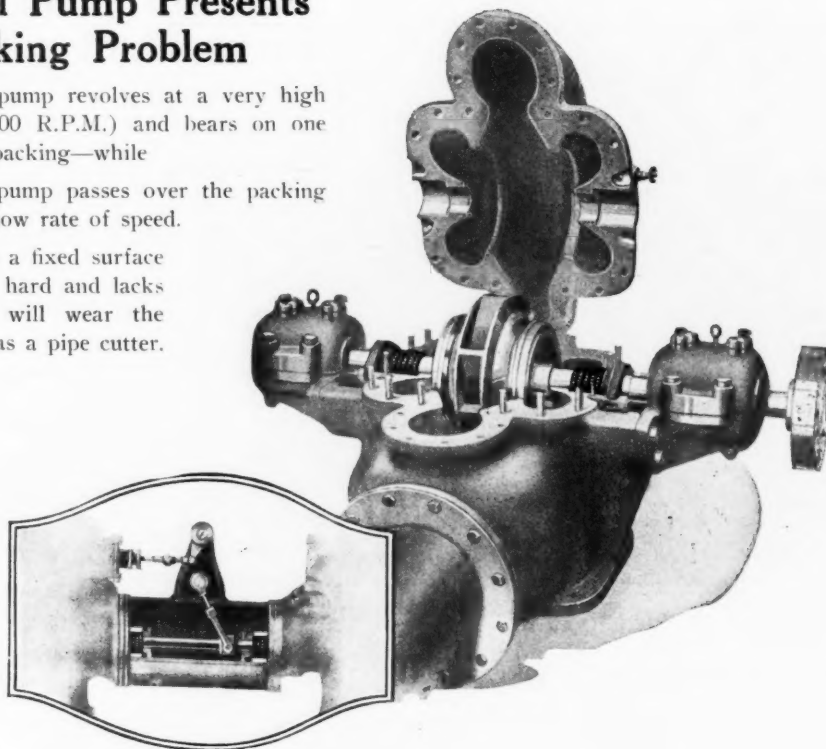
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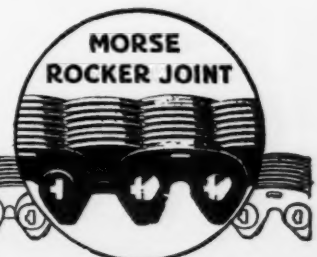
You can depend absolutely upon Morse Drives to be ready to go whenever you want the machinery to operate. They play a most reliable part toward assuring steady operation of ventilating fans, pumps, hoists, and other mine equipment.

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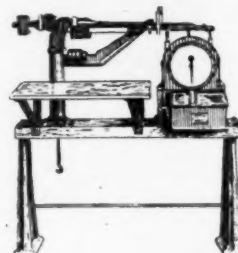
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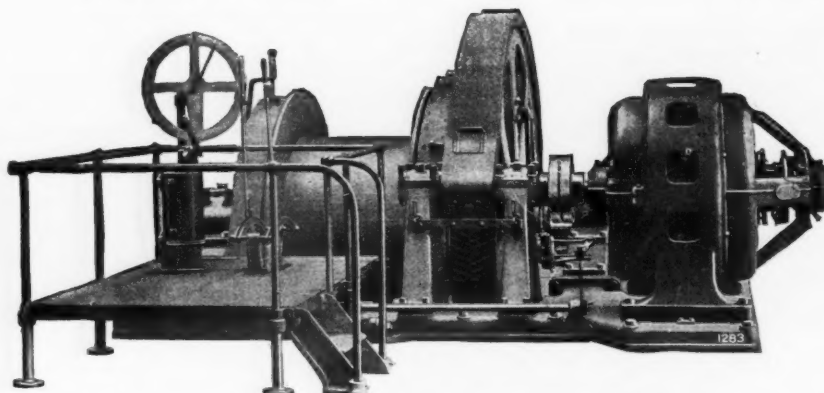
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Built in Types to
Meet Every
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as that called for
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UNDER CONTROL OF GEARED VARIABLE FEED

DRAGGING BACK AFTER FINISHING THE PLACE—AT FAST SPEED

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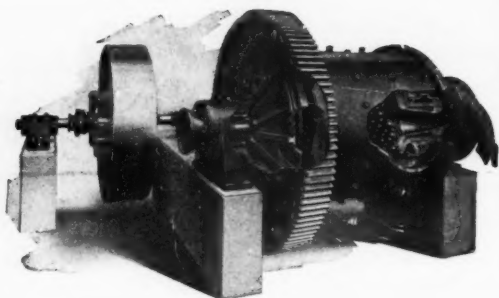
And besides, the Universal Control Shortwall has the Goodman geared variable feed drive—under friction *control* (not friction *drive*). This feed gives 100 per cent range of cutting speeds from zero to maximum—all by manipulation of a hand wheel. It applies to both ropes. It affords protection to the machine and perfect adaptation of the feed to all conditions.

*Can't tell the whole story here, but a letter
from you will bring full information*

(71)

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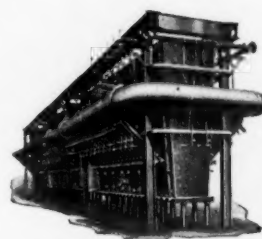
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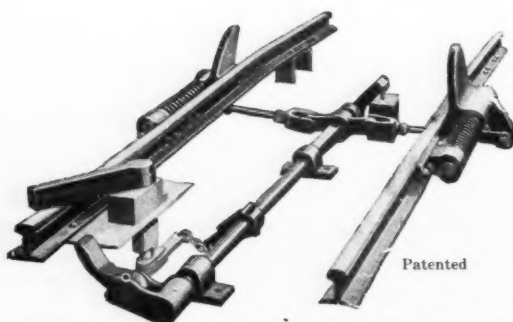
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At tripplens in connection with rotary, crossover and kickback dumps
At the head of inclines

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need.

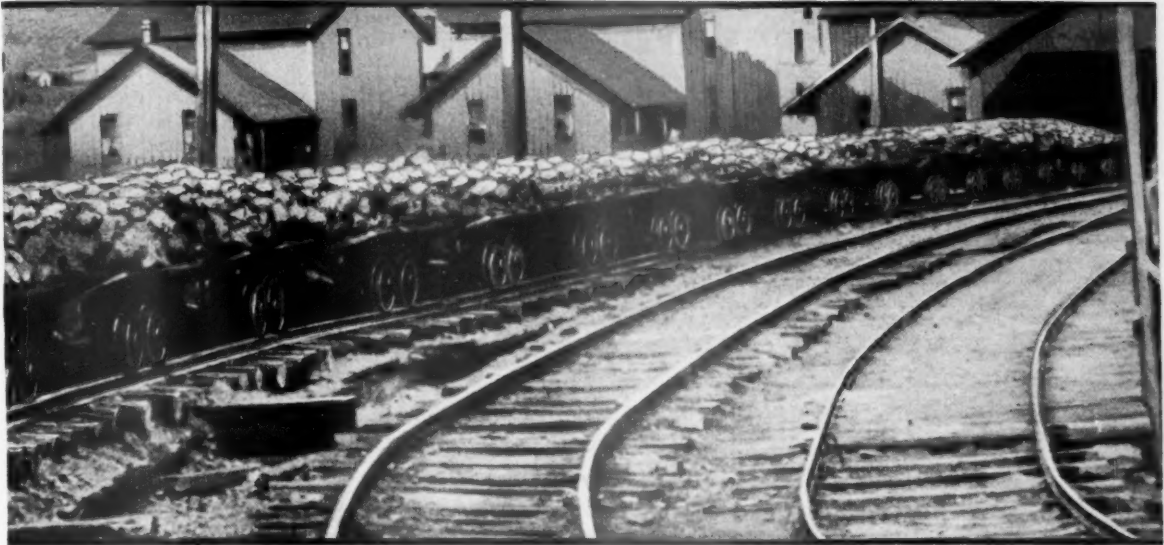
Write for Circulars



NOLAN AUTOMATIC CAGER WITH ONE SET OF HORNS

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Mining Safety Device
Company
Bowerston, Ohio

When Cars Strike Tracks Like These



THE bumpers of your cars tell the story. The bumper on one car is continually moving back and forth sideways against the bumper of the next car. This motion demonstrates that, in addition to usual radial load on the wheels and axles (the weight of the car and its contents), thrust and shock loads are continually developing.

But—when cars strike tracks like these, this condition becomes of even greater importance. The curve of the track, the unevenness of the road bed, the sudden shifting of the weight of the car from one side to the other, set up grinding thrust loads

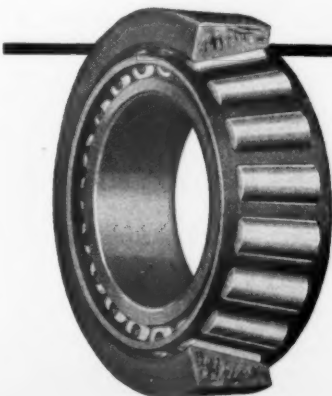
on the wheels. The bearings must take this continuous thrust load.

There is only one type of anti-friction bearing which will meet all the loads imposed upon mine car bearings *economically* and *completely*—the Timken type of tapered roller bearing.

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INDUSTRIAL DIVISION
CANTON, OHIO



TIMKEN
Tapered
ROLLER BEARINGS

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Standardization

A Good Investment

The Standardization Division

The Standardization Division of the American Mining Congress is composed of the best minds in the industry—operators, mining engineers, equipment manufacturers—working together to accomplish enormous savings in all phases of mining. A glance at the committees and committee members on pages 26, 28, 30 and 32 of the advertising section of this issue will show the scope of the work undertaken and the caliber of the men engaged in making the business of mining more efficient and profitable.

The Standardization Bulletins

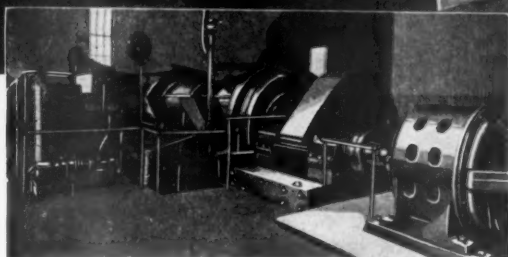
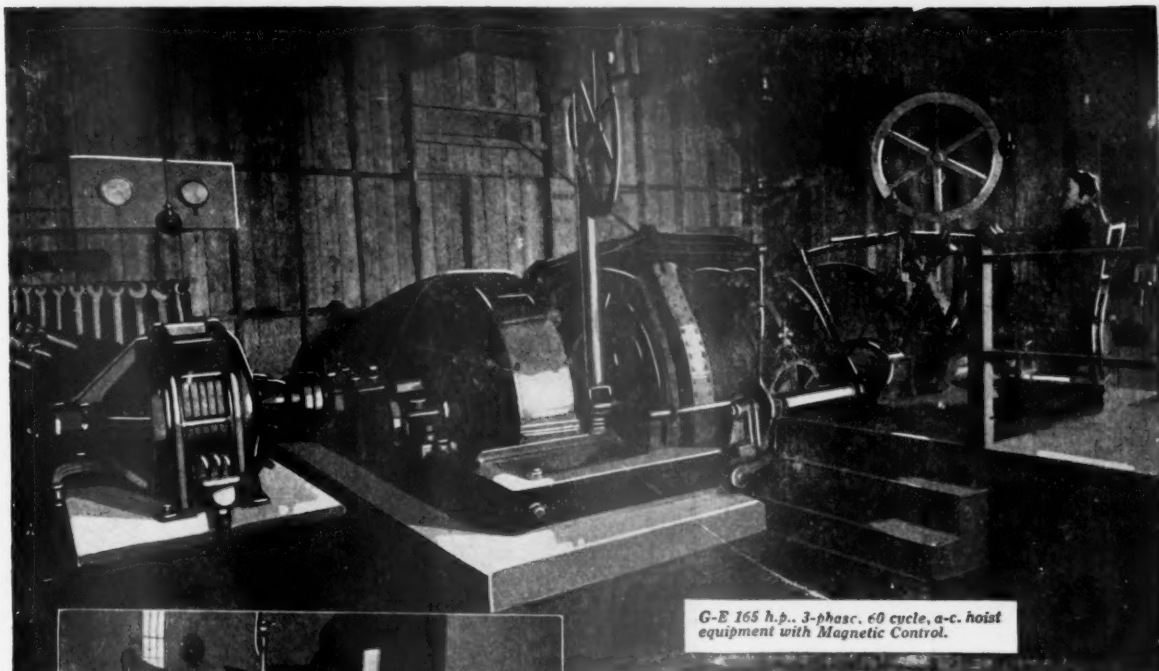
The National Standardization Bulletins are the annual compilations of the reports made by these committees in session at the conventions of the American Mining Congress. There are still available for distribution copies of the Third and Fourth National Standardization Bulletins which may be obtained from the national organization at \$2.00 per copy.

The Economy of Standardization

One company—the Elkhorn Piney Coal Mining Company—in spite of a material increase in mine output requiring increase in equipment and the replacement of old necessary to put standardization in effect—saved over \$45,000 in one year through the principles of standardization as outlined in these Bulletins. We will let you figure for yourself the percentage of return upon this investment.

The American Mining Congress

841 Munsey Building
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G-E 450 h.p., 3-phase, 60 cycle, a-c. hoist equipment.

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These electrical equipments are complete in every respect, including G-E Control best suited to the work—for *complete electrical equipment* is a feature of G-E Service to the hoist user.

G-E service embodies engineering and manufacturing facilities to fit electrical equipment to any required hoisting service specified.

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43B-838

TOTEM

The Statue of Liberty in New York Harbor, symbol of the opportunity afforded in this country for the development of the visions that work miracles.



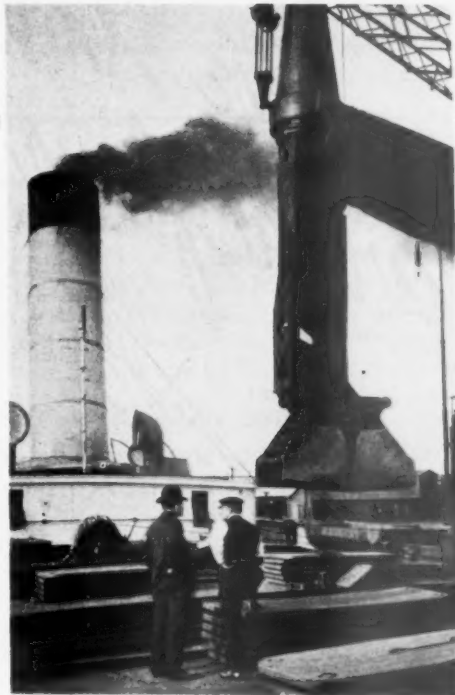
Photo by Brown Bros., N. Y.

of Industrial Vision

Vision, courage and signal accomplishment are borne witness to by the history of progress in mining and its allied industries. The gap is staggering that lies between the beginnings of mining in this country and the scale of operations now in force. But further progress demands that vision and courage today in a greater degree than ever. The responsibilities of the business, and the hazards, are now far greater—because of the importance of the position the industry has achieved for itself—because of the large communities directly dependent upon it—and because of the great web of all other industries in the country whose prosperity is directly and indirectly woven in with that of mining.

THE AMERICAN MINING CONGRESS

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The strength of this organization is derived from its members and every one in the industry reaps the benefit of its activity. It needs the support of each.

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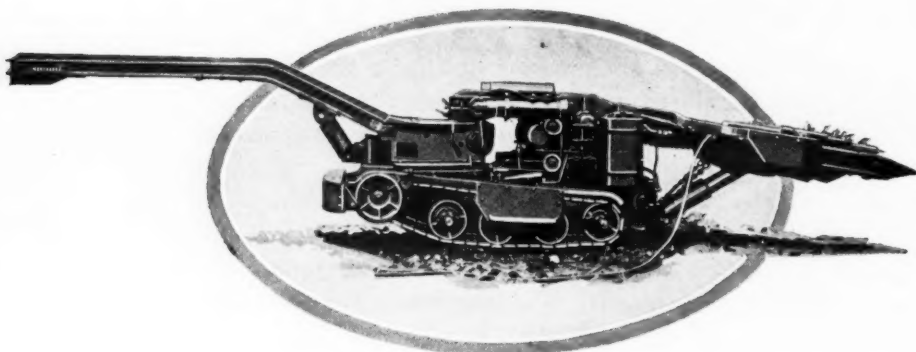
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THE TAX PRACTICE

THE rules of the Treasury Department governing admission to practice before the Bureau of Internal Revenue in tax matters, are liberal. Too liberal, in fact, for the public good. Almost anyone can be admitted to practice if their applications are accompanied by recommendations that are acceptable to the Department, regardless of whether or not they are members of any profession or have had sufficient experience with income tax matters to enable them to properly prepare and present a tax case. Thus, the mere fact that a man has been regularly admitted to practice before the Department is no guarantee to taxpayers that he is competent to handle tax matters or to advise taxpayers on either practical or technical questions involved in their returns. However, many tax practitioners have enviable records of demonstrated ability during the last seven years of high income taxation, and have built up a permanent clientele because of efficient service conscientiously and capably rendered. These will continue in the practice because their practice pays well and they enjoy the confidence of their clients. Others who have failed in their efforts to secure relief for clients because of their smattering knowledge of the law, regulations, decisions and procedure, are being rapidly eliminated. In the course of time, the tax practice before the Treasury Department will be on a high plane, and one of the principal causes for congestion in the income tax unit and delay in settlement of tax liability—the mis-handling of cases, confusion of issues, and cluttering of records—will disappear.

The Board of Tax Appeals recently promulgated rules to govern admission of attorneys and agents to practice before it. The Board did not intend that its rules should be liberal, in fact, it intended to restrict the practice so that some of the conditions that have prevailed in the practice before the Treasury Department would be prevented. But the Board missed the fundamental point—that persons admitted to practice before it should possess a thorough knowledge of the revenue laws and regulations. The Board merely requires that the applicant must possess and be able to submit either a certificate of good standing as a member of the Bar or a certificate showing that he is a certified public accountant in good standing. Engineers who have specialized for years in taxation matters are barred. Tax consultants who have represented taxpayers successfully for many years are barred unless they possess

one or the other of the certificates required. Even noted authorities on taxation who have been employed by both the Treasury Department and Congress to assist in drafting the income tax laws—economists and experts in taxation matters whose qualifications are beyond question—are denied admission to practice before the Board because they are not attorneys or certified public accountants.

The Treasury Department and the Board of Tax Appeals should have but one standard of qualifications for admission to engage in the tax practice—a standard that will be a reasonable guarantee to taxpayers that the practitioner is competent. In this connection, the rules of practice of the United States Patent Office are in point. The Patent Office requires those who desire to engage in the patent practice to prove by test cases that they have sufficient knowledge of patent law and procedure to properly present and safeguard the interests of clients. Even those who are regularly admitted to practice before the Patent Office are required to meet certain standards of efficiency and ethical conduct or be disbarred. Perhaps it would be impracticable for the Treasury and the Board to adopt requirements as strict as those applied by the Patent Office. But both certainly could improve their present rules and thus safeguard the interests of taxpayers just as the Patent Office seeks to protect applicants for patents covering their inventions.

The tax practice is a comparatively new profession. Tax practitioners should not be discriminated against merely because they lack professional certificates in the legal or accounting professions. The present rules of the Board make it impossible for many eminently successful tax attorneys to follow the cases of their clients through to a final decision.

In order to do justice to the taxpayer, it is necessary that the rules of admission of the Treasury and the Board shall be the same. Taxpayers should not be compelled to jeopardize their rights under a rule that requires them to change counsel at the crucial moment in the conduct of their appeals. And they should not be burdened with the additional expense incident to changing counsel. The rules of the Board should be amended at once so as to permit the practitioner who has prepared the case, presented it to the Treasury Department, prosecuted it to the point where issue is joined for appeal to the Board, and who is fully acquainted with every phase of the case and every issue

involved, to present it to the Board. The law provides that the Board shall be "an independent agency of the executive branch of the Government." It is not a court, was not intended to be a court, and any attempt to make a court of it will not be countenanced.

KNOW THYSELF

THE farmers and the bituminous coal operators are in similar difficulties for similar reasons. They are both doing an unprofitable and indeed a losing business. The plight of the farmers is much discussed because the farmers are a numerous company and because the nation knows and recognizes its dependence upon them. The plight of the bituminous coal operators is not causing much public concern because they are relatively few and because the nation does not realize or recognize its dependence upon them.

These two predicaments may be reduced to a few figures which are easily understood. The value of a dollar is now but 68 cents. This means, as compared with 1913, that it requires \$1.47 to buy as much as a dollar would buy eleven years ago. Translated into grain, that means that if the farmer got, in 1913, \$1 per bushel for his wheat, he should now be getting \$1.47. Instead, he is getting about \$1.25. On the same theory, if the bituminous coal operator, in 1913, was getting \$1.35 for his mine run coal, he should, today, be getting \$1.985. He is actually getting, on the average about \$1.99. However, the coal operator has had to absorb a 30 percent additional increase in the wages of his men, which about equals the 22 cent reduction in the price of the farmer's wheat.

Having thus stated the figures, we are up against a cold fact: If the farmer should increase his price to the point where he came out whole—to \$1.47, for example—he would find it impossible to sell the wheat in the international market. The producers of wheat in other countries would undersell him. And, if the coal operator should increase his price to the point where he could come out whole—recover the full amount paid the miners and the railroads—he could not sell his product. The people would buy the coal of other countries or would turn to a substitute for coal.

It is thus, clearly, impossible for either of the two business groups to recover their financial soundness by increasing their prices. If that is the case, they must recover their solvency by reducing their costs. The instant you raise that question, you are face to face with the fact that farm and mine labor are being paid disproportionate wages. The coal miners are getting more than the operator can pay. The farm labor is getting more than the farmer can afford to pay.

In addition, the high priced mine labor is refusing to relieve the distress of the operator by any accommodation whatever. He will not cut his wages. He will not use the machinery which will cut the labor cost of production. On the farm, we understand, the situation is somewhat similar.

The two distressed industries need to know the position in which they find themselves. It is not pleasant thus to point out the cause of their distress. Still, the solvency of the nation depends upon the financial soundness of these basic industries. In the face of such stubborn facts as here are presented, no possible good can come from concealment or from evasion of the issue.

SOME CONSOLATION, ANYWAY

THE fact is that many bituminous coal companies have gone into bankruptcy; others are going. If we accept the version of one of the most unrelenting of coal critics, this is not helping the coal industry in the solution of any of its problems; rather it is complicating things.

This critic says, for example, that the recent and avowed purpose has been to eliminate some of the surplus productive capacity. He says that, instead of accomplishing this purpose, the only result has been to bankrupt the owners of the mine. A coal mine, he insists, is but a hole in the ground. It will remain a hole in the ground, regardless of who owns it or even whether anybody owns it. And, so long as that hole remains in the ground and so long as coal remains at the bottom of that hole, that is potentially a producing mine. With the mine still extant and ready to produce, it makes no improvement, according to his view, to bankrupt the owner. It merely substitutes an unskilled for a skilled manager of that hole while leaving the productive capacity alive.

There seems at first to be considerable merit in this proposition. It has all the earmarks of being the absolute truth. But this statement must be recognized as having certain limitations. Regardless of these limitations, it remains true that to bankrupt the owner does not solve the problem of getting rid of the excess productive capacity. Without the latter, the coal industry is not helped, in the way it has wanted to be helped.

It remains to be seen whether there is any possible benefit to anyone from the trying experience which the coal industry is just passing through. It does seem that the consumer, in the end, may be benefited to a certain extent. Bankruptcy, sometimes, is a clearing house through which a load of old debts is lifted from the shoulders of a struggling industry. That is, without bankruptcy every commercial concern would be endowed with eternal life. Under such a system, all of the mistakes of the past would be perpetuated; all of the unfit would be continued forever in their jobs. It requires the purging influence of the bankruptcy courts, now and then, to expunge from an industry those who entered it unprepared for success and of those mistakes in judgment which will never, voluntarily, be admitted.

The trying experience of the coal industry at the minute is eliminating both of these undesirable factors from the trade. It is, to that extent, smoothing the path for those who are fit and for those whose decisions, primarily, were made with wisdom. If, at the end of this experience, there is left only those of sound judgment and well-made plans for commercial success, the people will, in the end, get a better grade of coal for less money. There is some mournful satisfaction in that fact.

The consumer, of course, must be the arbiter of the fate of all coal companies. Those to whom the consumer gives his business will remain alive—provided the price is profitable. Those from whom the consumer stands aloof must, inevitably, perish. It is, thus, a ticklish job that the consumer has ahead of him. He cannot afford to act on prejudice or from the standpoint of partisanship in any particular. And, to assist the consumer in reaching his decision, the producer can hardly afford to withhold from the consumer, in these days, a full statement of the reasons why he should be preserved.

IS THIS POSSIBLE?

THE specter of government ownership of railroads and natural resources, with politically selected and appointed managements and with civil-service examined and appointed operatives, seems so unreal and fantastic that one can hardly conceive of such a possibility. That such a specter should materialize into a vital issue of a political campaign in the United States where individual initiative and enterprise have been responsible for unparalleled industrial and commercial development and expansion, is almost unbelievable. But the fact remains—the specter has materialized into a dominant issue that must be met.

The fact is that the scheme not only is colossal, but involves consequences that even now are so apparent that its adoption would be a colossal blunder. If railroads and natural resources are valued conservatively at \$35,000,000,000, their transfer to government ownership would immediately deprive State and local governments of that amount of taxable property which now yields a major part of the taxation revenues of these governments. Therefore, other taxable property would be compelled to bear an added burden of approximately \$600,000,000 annually, and perhaps more. The reason the burden might be greater is that taxable railroad stocks and bonds and taxable dividends would be replaced by tax-exempt government bonds issued to acquire the properties. Agriculture, the principle industry then remaining in the taxable class, would have to bear the brunt of the added burden.

The public debt would be increased by at least \$35,000,000,000. The railroads and natural resources for years have not, as a whole, yielded a fair return on that value. Therefore, in order to pay an annual interest rate of even four percent on \$35,000,000,000 of tax-exempt bonds, freight rates and passenger fares would have to be increased. Then, if promised wage increases are granted the seven million employees in these industries, and they are given civil-service retirement pensions, transported with their families on government passes, and furnished government quarters and fuel, someone would have to pay the bill. The roads and mines could not possibly earn expenses at existing rates, and, unless rates were increased, deficits would be made up by appropriations from the people's money in the Treasury, as was done during the recent period of government control.

The bold attempts that are being made to mislead the people on this important question are most reprehensible. Alluring word pictures are being thrown on the screen of publicity to catch the eyes of the unwary, and wily promises are being made in the public forum to appeal to the ears of the credulous. Fundamental principles are being ignored, and superficial dogmas are being broadcast. Therefore, popular misunderstanding of the issue may prevail unless the materialized specter of government ownership is unmasked and the light of truth focused upon its flimsy framework. Is it possible that this creature of political dreamers may yet stalk the nation's basic industries and trample under foot the most sacred ideals and standards of Constitutional Government?

GOVERNMENTAL RELATION TO BUSINESS

IN THE development of our complicated civilization the regulatory and supervisory functions of government are properly employed to safeguard to the people their constitutional rights. This principle is admittedly sound, and the functions so exercised should be determined to be just or unjust by the motives and methods which actuate them.

During the stress of war, however, our government entered the field of ownership and operation of industries. Then came the effort led by demagogues to shift the economic problems of certain groups of the citizenry onto the whole body politic.

The very groups who hoped to be so benefited are the ones who are chafing under the resulting burdens of taxation. The clamor of these minority groups has deceived the already self-deluded demagogues to lead them into the thought that this clamor is general. Just as they were in the passage of the soldier bonus, the demagogues have been out-demagogued by small minorities. Just as the reaction came from the mass of voters following passage of the soldier bonus, similarly is the reaction coming against this expensive paternalistic experiment of the government in industry. That nation is best governed which is least governed and that people is the best served by its government which is permitted to stand squarely on its own feet without paternalism in the working out of its economic problems, all of which are interdependent. No one wheel in our economic machine can be speeded up or retarded by governmental interference without throwing it all out of gear and ultimately breaking it down.

GOOD OUT OF EVIL

IT IS adroit truth twisting to refer to an adverse decision of the Supreme Court as "the veto power of the court." It is diabolic demagoguery to talk of "the legislative power of the court." It is the Constitution and not the Congress of the United States which provides for the citizen the fundamental protection of his rights. And it is the Supreme Court which properly says, "Thou shalt not," when ill-advised legislation crosses the well-defined line of constitutionality. Much good will ultimately come out of La Follettism's attack on the Constitution. The attack itself will of course fail. A legislative body with its authority supreme and unlimited based on its own "ipse dixit" is a tyranny unthinkable. But in defending those checks and balances of power so wisely provided by the Constitution, we are as citizens going to learn more about that Palladium of our liberties which we refer to vaguely as our constitutional rights without really knowing much about their source. Rather like a man who, on attending a production of Hamlet for his first time, said he didn't see "why in this day and age they should write a play made up almost entirely of quotations."

TOO MUCH CAKE

THE Jacksonville Wage Agreement has been a costly thing for both union miners and union operators. Fixing a wage scale that forced coal cost above possible sale price had the inevitable result. The properties were operated intermittently and finally many closed down. A wage agreement is a business contract and when it kills business it is a bad contract for both parties to it. There is no more useful fable than the one of the monkey which got its hand in a jar of figs and such a large handful that it could not get them out and so starved to death.

WHAT THE GEOLOGICAL SURVEY IS DOING FOR THE MINING INDUSTRY

The Survey Is Making A Very Thorough Investigation Of The Future Possibilities Of The Mother Lode Country In California And The Michigan Copper Country—Their Investigations Of Non-Metallic Minerals Have Developed Many New Industries In The Past Few Years—Dr. Smith In This Article Tells Of The Work They Are Undertaking And What It Means To The Mining Industry

By GEORGE OTIS SMITH *

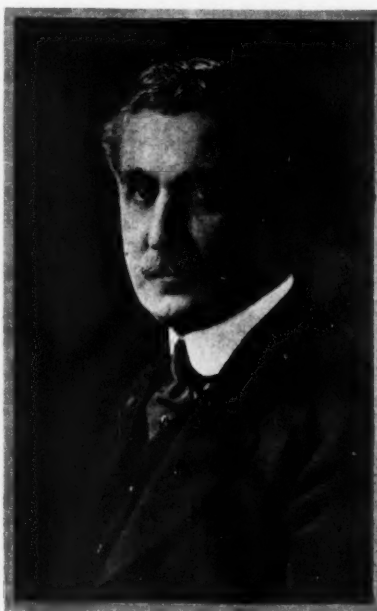
FOR forty-five years the United States Geological Survey has sought to promote the welfare of the mineral industry. In 1880 Director King, in presenting his vision of the future of the new organization, forecast its field of endeavor as the development of our material resources, an industrial conquest which the country had then only begun. He more specifically outlined the contribution to be made by this Federal service as "the noble work of investigating and making known the natural mineral wealth of the country, current modes of mining and metallurgy, and the industrial statistics of production."

Two of these lines of investigation remain as primary duties of the Geological Survey—the study of the distribution of mineral wealth, a study based upon facts accurately determined in the light of modern geology, and the publication of the current statistics of mineral production. The other duty, the technologic investigation of mining and metallurgy, now belongs to the Bureau of Mines. A few statements regarding its present day activities may suggest the extent to which the Geological Survey is now serving the industry it was intended to serve.

The mineral industry has both grown and changed since the Geological Survey began its work; the value of the annual output has increased more than tenfold, and the value of the annual output of the non-metallic products, then slightly less than half the total, has now become three times that of the metals. Because of this change the emphasis that was earlier put on geologic work in the great metal-mining districts of the West is now put upon work on the mineral fuels and other non-metallic minerals.

Last year, the geologic examination of areas valuable for their oil and gas, coal, potash, or other non-metallic resources required an expenditure of Federal appropriations four times as great as that made for the study of metalliferous deposits. Yet it is noteworthy that two special investigations now in hand relate not to new but to old metal districts, still important as producers. It is hoped that these two projects will throw light on the occurrence of gold and copper. One of them is the critical study of the quartz

veins of the Mother Lode in California, where apparently significant relations between ore shoots and barren veins have yet to be made out; the other is a thorough study, surface and under-



George Otis Smith

ground, of the Michigan copper country. The investigation in Michigan, begun by private companies actuated by enlightened self-interest, was carried out by them in a thoroughly scientific manner at great expense. Through their generosity the results of this work will be embodied in a report covering a much wider area. The results should be of great scientific and practical value.

The investigation of our resources in potash furnish an illustration of the ever-changing demand on the geologist. In 1910, when the German potash monopoly treated as "a scrap of paper" its contract with American consumers, the search for American potash was begun in earnest. When the foreign supplies were cut off during the war the American mining industry accepted the challenge and under the stimulus of high prices produced potash amounting to about 20 percent of our normal pre-war requirements. Now,

however, with low prices, only one American deposit can be worked profitably, and the search for potash continues.

Investigations to discover deposits of potash have centered largely in southwestern Texas. Here the discovery of potash in well after well, the definite recognition of a potash-bearing mineral (polyhalite), the proof of the presence of potash of commercial grade, and the prospects of finding commercial deposits similar to those of Germany and Alsace are all encouraging. In this work the Survey maintains cooperation with well drillers and with oil companies drilling in the region. Samples are collected and studied in the field and sent to Washington for analysis.

MINERAL FUELS

Although by far the largest item in the Survey's expenditures on economic geology is that devoted to the mineral fuels, yet the amount available is lamentably inadequate to occupy fully the field of research that demands attention. Classification of the millions of acres of withdrawn coal and oil lands in the public domain goes on steadily from year to year, but research is much more needed than even this land classification. For example, the ever-increasing demand for power and the special requirements for particular types of coal by particular industries emphasizes the need of research as to the nature and composition of the different coals, as determined by their origin and occurrence, and the special fitness of the different coals for this or that use.

Throughout the current year a form of research that had been neglected temporarily—the study of the nature and origin of oil shale—has been carried on. Field studies leading to a clearer understanding of the conditions under which oil shale was laid down have been coupled with laboratory research—by the microscope and by chemical, biological and botanical studies—in attempts to determine the constitution of oil shale, not only with reference to its commercial use but with reference to the bearing of the constitution of the shale on the origin of oil. The results of these studies will certainly promote a more intelligent search for oil when failing supplies necessitate the location of the less easily exploited sources.

The statistical service which the

* Director, United States Geological Survey.

Geological Survey is rendering to the mining industry is only another side of the geologic work, so closely coordinated are the two types of service. The superiority of the mineral statistics of the United States over those of most other countries is due largely to the policy, early adopted, of employing for the collection of these figures of production a group of trained specialists who know the Nation's resources as well as the mines and smelters, and who can interpret, therefore, the statistics they collect. The more complete the statistical picture and the truer its perspective, the more useful it can be to the industry. The violent fluctuations in mineral output during the past ten years may have diverted attention from the record of continued increase during the longer period. It is well to remember that during the 20 years, from 1899 to 1919, while population increased 40 percent, the volume of manufactured goods roughly doubled, but the output of mines and quarries more than doubled. As I stated it before an audience of statisticians: The mineral curve expresses increments in civilization as well as increases in population, whereas agriculture, in the meantime, barely keeps pace with the growth of population.

In its collection of mineral statistics the Survey regards the figures showing production and consumption and stocks not as an end in themselves, but rather as a means, often the starting point for scientific investigation by this or some other research organization. The two bureaus in the Department of the Interior that serve the mining industry work with the threefold purpose of assuring an adequate supply of the essential minerals, decreasing their cost, and increasing their value as measured by usefulness. In investigative effort of this type statistics are merely tools, and they are tools that are needed by the owners and operators of mines and smelters.

ALASKAN OIL

One of the spectacular items in the current work of the Geological Survey consists in its examination of the naval petroleum reserve in Northern Alaska. The first of these exploratory expeditions was made in the summer of 1923, and the second was started in the following winter. This field examination has been undertaken at the request of the Secretary of the Navy, to determine the possibility of finding oil in quantities suf-

ficient to add materially to the reserves available for the future use of the Navy, if not indeed large enough to augment the Nation's supply for other uses. The first season's examination along the Arctic coast verified the reports of large oil seepages and of geologic conditions sufficiently favorable to oil accumulation to warrant the second expedition, which started northward with dog sledges from the Yukon in February last and had crossed the Endicott Range by March. The summer's work was successfully completed, and the members of the expedition are now returning from Point Barrow by way of Nome, the Yukon, and the Government railroad. The area traversed and mapped by the three

tenance of scores of stream-gaging stations; and the publication of 420 maps and 383 reports are other items in the systematic scientific investigations carried on in this vast outlying area—the whole making up a record of consistent promotion of Alaskan interests in which the Department of the Interior may take justifiable pride. Since July, 1903, Alfred H. Brooks has been in active charge of this work, and he has become the recognized authority on the geography, geology, and resources of Alaska, but the credit for what has been accomplished he would wish to divide among his associates, more than a hundred geologists and engineers who have shared in this pioneering work.

According to the Geological Survey reports, the total mineral production of Alaska has been about half a billion dollars, and practically all of this sum has been added to the country's wealth since the beginning of the present century and half of it during the last decade. In his latest progress report, now in press, Colonel Brooks refers to the fact that nearly all that is said of the vast mineral reserves of Alaska is based on information derived from geologic surveys that have covered less than a third of the Territory. Though naturally the areas selected for such surveys have been those that offer



Treadwell Mine, Alaska

parties of this expedition is roughly 3,700 square miles and lies within the largest tract of unexplored United States territory. Dr. Philip S. Smith, the geologist in charge of this exploration, made plans for it 13 years before, when he was working on the southern margin of the area.

This search for an oil field in Arctic Alaska illustrates the emphasis now put on geologic work in the exploration of fuel resources, but the nature of the exploration and the experienced personnel available for it, fittingly mark the status of the Geological Survey's work in Alaska after 25 years of uninterrupted effort. In the quarter of a century since 1898 slightly more than \$2,000,000 has been appropriated for the investigation of the mineral resources of Alaska, and by this means over one-fifth of the area of the Territory has been covered by reconnaissance geologic surveys and more than one-quarter of it by reconnaissance topographic surveys. Exploratory surveys over thousands of square miles and visits to hundreds of mining camps, large and small; the main-

the greatest promise of mineral wealth, yet the much larger unsurveyed areas probably contain districts of mineral importance. He mentions two fairly accessible regions in central Alaska, which include areas that are together three times as large as Massachusetts which are unsurveyed and whose unknown resources must be ignored in any estimate of our mineral wealth. The prospector and the geologist yet have virgin country to visit.

And so over the whole of the United States. Any review of the Survey's current work is in a sense an indictment for work undone. Not only are there these areas as yet untouched by the geologist, but the call for more intensive work in older fields is constantly heard, even though apparently unheeded. New problems for the geologist and engineer appear with every advance of the mining industry; new requirements in the industrial and commercial world make new demands upon geologic science; and the words of the Geological Survey's Director of 45 years ago are still true: "We have only begun; we have the great work still before us."

GOVERNMENTAL RELATION TO BUSINESS

America's Undeveloped Mineral Resources Are The Industrial Currency Of The Future, And The Nation Must Consider Well Their Development—Government Ownership And Operation As A Success Is Purely A Political Myth And Would Spell Chaos If Applied To The Mineral Industry

By DR. HENRY M. PAYNE*

PROSPEROUS industry and good citizenship produce thriving communities and contented people. Neglected resources and nonchalant acquiescence to demagogic theories lead to disorganization and widespread unrest.

Socialism arrives, not alone by revolution, as in Russia, but by gradual and insidious interference with private enterprise by the state. The radical, the theorist and the opportunist want to experiment with government ownership and operation. The achievement of the vision of the pioneer through hardships, work, and courage is replaced by the visionary accomplishment of the theorist, through misuse of the functions of government.

It may be assumed that all average citizens have an equal interest in government. When the Government enters into industry, certain citizens have a special interest in government.

America's undeveloped mineral resources are the industrial currency of the future. Her agricultural products will find added markets in proportion to the expansion of the mineral industry.

Where cheap power meets cheap transportation near the source of raw materials, great manufacturing centers spring up. Diversified industry is a stabilizer against industrial depression. Diversity of product, both in mining and agriculture, means added markets, decreased taxation because of increased property values, and contented workmen employed near their own homes, rather than in congested centers of population.

Such developments should be encouraged by the removal of every handicap and by permitting the enjoyment of every reasonable reward for successful effort.

But immediately an industry or a group of industries begin to thrive, the reformers and the politicians become imbued with a desire to control them through the public payroll. Such public operation means political management. It does not mean a disinterested citizen giving up his time; it means an interested politician distributing favors.

That nation is best governed which is least governed; and those people are best served by their government who are per-



mitted to stand squarely on their own feet, without paternalism in the working out of their economic problems, all of which are necessarily interdependent. No one wheel in our economic machine can be speeded up or retarded by governmental interference without throwing it all out of gear and ultimately breaking it down.

All those things which in their nature afford sufficient reward to prompt human endeavor should be owned and operated by the individual and not by the Government.

Whenever the Government enters any field of industry, ownership or operation, there are immediately brought to bear against all private industry in the same field all the powerful governmental forces of investigation, aggression and coercion, maintained by wasteful and uneconomic governmental expenditure, because there is no necessity for profit, in order to support the preeminence of the governmental segment of this industry, no matter how relatively small it may be, as against the entire field of private industry, no matter how large it may be.

The fundamental purpose of a business is to deliver to its customers either

merchandise or service at a legitimate profit. The building up of a surplus out of profits in a business is a desirable and a necessary thing.

The fundamental purpose of a government is to deliver to its citizens protection and justice, without a profit. The building up of a surplus out of taxation in a government is a vicious and a dangerous thing.

Let the general government

(a) Protect us against foreign aggression;

(b) Preserve the peace and regulate commerce between the states;

(c) Provide and maintain a stable and elastic circulating medium;

(d) Enforce the decrees of the courts;

and it will have performed the major portion of its rightful functions.

The late Herbert Spencer expressed this most forcibly when he said:

"It is not to the state that we owe the multitudinous useful inventions from the spade to the telephone; it was not the state which made * * * the discoveries in physics, chemistry and the rest, which guide modern manufacturers; it was not the state which devised the machinery for producing fabrics of every kind for transferring men and things from place to place, and for ministering in a thousand ways to our comforts. The world-wide transactions conducted in merchants' offices, the rush of traffic filling our streets, the retail distributing system which brings everything within easy reach and delivers the necessities of life daily at our doors, are not of government origin. All these are the results of the spontaneous activities of citizens, separate or grouped."

The United States has made the greatest economic progress during the last generation of any country in the world. It was not because of socialism that the right of suffrage was extended to women, or that lotteries were abolished or that franchise was granted to persons of foreign birth. Nor do we need anarchism, nihilism, internationalism, paternalism or any other ism except patriotism.

We are demanding more and more of government and at the same time demanding lower and lower taxes. Let us not lose sight of the source from



* Consulting Engineer, American Mining Congress.

which these funds are derived. Your government hasn't a dollar in the world. Every dollar that passes through the government payroll comes out of taxes, yours and mine.

Many of our states are commission ridden, and topheavy with tax spending agencies whose duties should be performed by state officials. In many states assessment valuations are so erratic that were a true assessment made on a 50 percent valuation the tax rate could easily be cut in half.

We have endured an orgy of borrowing and spending due to the ease with which funds might be secured through the sale of tax exempt bonds. Over twelve and one-quarter billion dollars of wholly tax exempt bonds are outstanding in this country today.

Every dollar of these, both principal and interest, must be met out of taxes, yours and mine. We are all human, banker and individual alike, and as long as we can invest our money in tax exempt securities these vast sums of liquid capital will remain withdrawn from the normal productive channels of industrial enterprise and will impose a drain upon the basic industries of the country, in the form of increased taxes and prohibitive carrying charges.

Every time a substantial sum is taken from the available sources of investment capital and placed in tax exempt bonds, we have deprived legitimate industry and public utilities of just that amount of money for industrial development.

Similarly when any utility is taken out of the hands of its logical owners and those whose foresight and executive ability have made its development possible—and placed under government operation, whether federal, state or municipal, we have decreased the source of taxes, and have increased the public payroll, already numbering one in every twelve of our total population, but whose support nevertheless is wholly dependent upon the taxpayers.

For illustration, in 1912 the tax rate in Seattle, Wash., was 15 mills, and the cost of government was \$40 per capita. Since 1912 more than \$50,000,000 worth of property has been taken off the tax rolls and put under municipal ownership. In 1924 the tax rate is 28 mills and the per capita cost of government is over \$100 and it is already estimated that the rate next year will be 30 mills.

The municipal operation of the Chicago water plant has shown an annual deficit for many years, the amount for 1923 being \$1,100,000. The plant is run at a loss and sustained by borrowing money.

In California, where electric light

the Grand Trunk Railway been taken into consideration.

In our own little railroad experiment we have just made the final payment of \$1,115,000,000 which it cost us in actual cash, besides many other items of intangible valuation, to learn the difference between efficiency of private operation and bungling red tape and inefficiency in government operation.

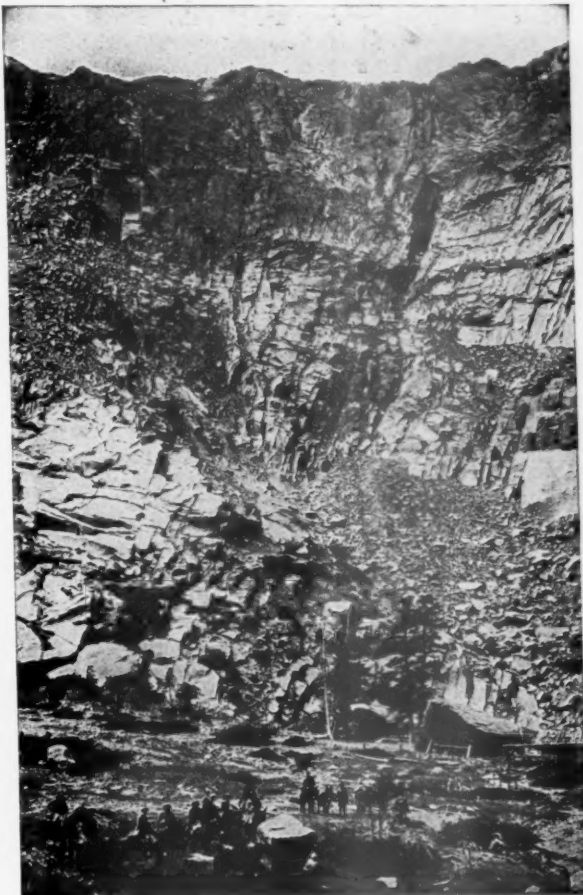
In foreign countries we find that at one time the French led the world in the production of matches. The industry was so profitable, the government, seeking revenue, took it over. The result: the state with five factories is unable to do what private industry accomplished with two. The state employs nine men where private operators employed one. The product is so poor the French people spend annually from twelve to fourteen million francs for the purchase of foreign matches.

Great Britain, attempting national insurance against unemployment, is paying out \$4,000,000 a week as "doles" to the unemployed. Wages have been forced up but 900,000 men and women prefer pauper idleness to self-support. This insurance is the fulfillment at the taxpayers' expense of the defaulted promises of a bankrupt scheme of national insurance.

In our own country state life insurance in Wisconsin has failed; savings bank insurance in Massachusetts has failed; hail insurance in North Dakota has failed; the state auditor's report on the monopolistic state fund in Washington showed a half million dollar insolvency at the end of five years; West Virginia workmen's compensation insurance showed deficits running from \$300,000 to \$600,000 per year; in Ohio the cost of state insurance administration is borne by the taxpayers, whereas before the state went into the insurance business the companies carried all costs of administration and paid 3 percent taxes besides.

The state has no more right to go into the insurance business than it has to enter the clothing business, the candy business or any other business which can be conducted under private initiative.

Every user of anthracite coal will recall the Pennsylvania situation a year ago. The miners were intolerable in their arrogance; the operators had the manhood to resist. At a critical moment Governor Pinchot arbitrarily awarded



Courtesy Colorado Springs Chamber of Commerce

companies or electric railway companies have been taken over by the state, there is less property on which to raise revenue and so the rate on all the rest must go up. The farmers, not being beneficiaries to any extent of the low rates of state utilities, get none of the benefits, but come in regularly and handomely to make up the deficits.

Canada's government-owned railroads show a surplus only by appropriating government funds to be applied for capital expenditures, in amounts increasing from \$18,000,000 to \$75,000,000 during the past year; and by omitting the interest on the capital cost of constructing over 5,000 miles of line, on the ground that the government paid the cost of construction in the first instance, and liability thereon is taken care of in the annual debt. Nor has the liability attaching to recent guarantees on over \$200,000,000 of the debenture stocks of

the miners a 10 percent increase when they would have been perfectly satisfied to have maintained the existing rate. The increase amounted to \$45,000,000 annually, paid out of the pockets of the consumers.

The bituminous coal industry, prior to August 10, 1917, was innocent of any governmental interest or interference. Prior to that date less than 30 percent of the operating companies had ever paid a dividend. Of all the coal producing states, Pennsylvania, which includes the great anthracite fields, averaged 2.35 percent earnings on the total invested capital of the coal industry. Of the next six states in the order of production, one had for many years just broken even and five had sold below the average cost of production.

Under 18 months of governmental price-fixing in the bituminous industry, more than two-thirds of the companies in all the coal producing states paid dividends, and the consumer paid the bill. This is where the scandalous profits came from, and it must be expected in the future, if coal is regulated by any other law than that of supply and demand.

During President Taft's administration a bill was passed by Congress authorizing the construction of two identical bridges across the Potomac River at Washington. The plans were identical; the contracts called for a construction cost of \$1,000,000 each, and one year's time. The bridges were 100 yards apart, the one decked for railroad use, the other for highway and trolley.

Congressman Campbell, who was chairman of the Rules Committee and auditor of accounts on these bridges, states that the railroad bridge, constructed by the Southern Railway, was built in 11 months and one week at a cost of \$925,000; the other built by the Government was completed in three years and four months and cost \$3,400,000.

Tax money when economically spent, produces wealth. But revenue raising must not interfere with the wealth producing process, which alone makes taxes possible.

We have seen in years past great appropriations for river and harbor improvements on streams where the total possible commerce over a long period of years could never equal the cost of the improvements alone.

The statement was recently made that the Shipping Board has cost \$5,000,000,000 while the total appraisal value of its miscellaneous aggregation of ships is estimated at \$200,000,000, which is less than the interest that the taxpayers must pay every year until this colossal debt is paid.

All over this country we see government appropriations for good roads held

up for political reasons, sometimes two and three years, while the politicians decide those farms the road shall pass. Do we want similar methods applied to our industries and utilities?

The State of Massachusetts has had long experience in municipal ownership and operation of electric plants. Over a period of years it has been shown that the cost of manufacturing current is 33 percent higher than in private plants. The cost of distributing is 21 percent higher, and the cost of labor per unit is 53 percent higher. The loss of current in distribution from municipal plants is 31 percent greater, the cost of coal $7\frac{1}{2}$ percent greater, and the labor efficiency 32 percent lower, than in private plants, operating under the same conditions in the same state.

According to the last census three times as much fuel and labor are required per unit of production, in municipally owned plants as in private plants. The taxpayer pays the difference.

Governmental activities are invariably begun with justifiable enthusiasm. When this enthusiasm has run its course there has been built up a group of employees who naturally want to retain their employment. When the postal savings banks were first started their purpose was to encourage thrift.

This habit was learned by thousands in a surprisingly short time and they also soon discovered that the banks were paying higher rates of interest and transferred their savings thereto. Whereupon the official bureaucracy fought for two years to have the Government rate of interest raised so that they could maintain their own jobs and compete with the banks.

We may logically expect any day to hear some sincere but misguided scientist tell us that if he were only provided with \$5,000,000 in one year's time he could kill all the cockroaches in the United States, and that the savings in food and the conservation of the public

health would justify the expenditure. His statement may be entirely true, but the important thing is that the people should be permitted to kill their own cockroaches.

Let us make a mental diagram "Government and Business." Down through the center draw a dividing line. On one side let us put the "permissibles," these are supervision and regulation. On the other side let us put the "Thou Shall Nots," these are public ownership and operation.

In other words, just as a board of health has a right to supervise drinking water supply and sewerage disposal, so, in the complexities of our present civilization, the Government has a right to supervise and regulate business, each separate case being considered on its own merits.

But when we come to the other side, government has no right whatever to own or to operate any of the great utilities or other industries upon whose prosperous operation and efficient management, is dependent the welfare of the people at large.

Let us therefore draw an "X" across the "Thou Shall Nots"—they are all wrong—they are unthinkable—undebatable—uneconomic and un-American.

And to whom are we indebted for this un-American invasion which has so insidiously created an undercurrent which threatens the integrity of our great industries? We are indebted to the slimy scum of Southern Europe, many of whom were sent here by their governments to avoid the expense of building a gallows on which to hang them.

Yet, when for our own protection we pass a selective immigration law, these nations protest that "such action deeply wounds the pride of their people." What of it? Must we add to our asylums and populate our penitentiaries in order that their pride may not be wounded?

Let us lay down the principle that admission to the United States is a privilege, and not a right; and that there is no greater privilege in the world than that of American citizenship.

We have been told that it is necessary to open our gates to these foreign swarms in order that there may be plenty of labor. It is better to have a supported government continually functioning and to be occasionally short of labor than to have a plentiful supply of labor and have the Government of the United States and the Supreme Court continually under attack.

Let us ignore the deceptive demands of the demagogue and the pathetic patter of the petty politician, let us give and receive in industry and in government, from employer and employe alike, an honest day's work for an honest day's pay.





Sacramento from the State Capitol Dome, the Capitol Extension Building in the Left Foreground

THE MAJOR PURPOSE TWENTY-SEVENTH ANNUAL CONVENTION THE AMERICAN MINING CONGRESS

A National Mining Platform Is Deemed An Essential To Progress In The Industry—This Convention Will Endeavor To Put Into Concrete Form The Best Thought Of Mining Men In Every Branch Of The Industry, In The Hope That The Crystallized Thought Will Result In The Elimination Of Many Of The Industry's Perplexing Problems, And In The Advancement Of Mining, Economically And Legislatively

ONE of the major purposes of the 27th Annual Convention of the American Mining Congress to be held at Sacramento, California, during the week of September 29, is to formulate a national mining platform which will have the united support of all phases of mining and which by cooperative effort can be made an effective medium for solving the perplexing problems of the mining industry and make possible greater production and wider distribution of mining products. This proposed mining platform is to have nine major planks, which include the proper financing of mining enterprises, federal and state taxation, industrial relations, government paternalism, a tariff on minerals, standardization or cost reduction, practical operating problems. There will be separate planks covering the gold industry and how that industry may be rehabilitated, the coal industry, both bituminous and anthracite, and silver production.

The program, as announced, includes a series of topics that are indeed pertinent to the needs of the industry. There will be on Tuesday, September 30, a session at which will be discussed "The Needs of the Industry," and the subject will be opened for discussion by R. E. Tally, Arizona; Jesse McDonald, Colorado; Stanly Easton, Idaho; S. Pemberton Hutchinson, President National Coal As-



State Capitol and Convention Hall

sociation, Philadelphia, Pennsylvania, and other representative mining men.

There will be a thorough presentation and discussion of taxation problems, from both the National and State viewpoints; Industrial Relations, Standardization and Cost Reduction will have especially interesting sessions.

Government encroachment in private business will be one of the liveliest topics discussed at the convention. The special conferences on Gold Mining, The Coal Industry, Silver, A Tariff on Minerals, and Group Conferences, all will be

noteworthy, and it is anticipated, will result in a mining platform upon which a united industry may stand both in presenting and defending its principles.

The speakers include Hon. S. H. Shortridge, United States Senator from California; Hon. E. J. Henning, Assistant Secretary of Labor; H. W. Seaman, President, The American Mining Congress; W. J. Loring, President, Carson Hill Cons. Mining Co.; Stanly Easton, Bunker Hill and Sullivan Mining Co.; C. B. Lakenan, Nevada Consolidated Copper Co.; S. Pemberton Hutchinson, President, Westmoreland Coal Co.; Jesse McDonald, President, Downtown Mines Co.; A. Cressy Morrison, Union Carbide Co.; Norman Moray, Vice President, Hartford Insurance Co.; Robert E. Tally, United Verde Copper Co.; A. G. McLaughlin, President, Chamber of Mines and Oil; Charles A. Mitke, Consulting Engineer; Paul Shoup, Southern Pacific Co.; W. E. Creed, Pacific Gas & Electric Co.; F. T. Griffiths, Portland, Oregon; W. V. DeCamp, United Verde Copper Co.; and important mining men, and government officials.

In addition to the serious discussion of the problems of the mining industry there will be unique entertainments arranged by the Sacramento committee. They are preparing to receive the delegates attending this meeting with true Californian hospitality. Hundreds of

men in Sacramento have started to grow whiskers, scores of women are having hoopskirts made, while shipments of old time red flannel shirts are on their way to take place in the Whiskerinos' parade and pageant on the opening day of the convention, with a revival of the Days of '49. Stage coaches, prairie schooners and saddle horses will be used in the big parade, while the evening will be devoted to a gigantic pageant showing the scenes and historic incidents of the gold rush to California.

The Sacramento committee has also arranged to take the delegates on Wednesday afternoon, October 1, to the famous old mining camps at Auburn, where the entire afternoon and evening will be given up to a delightful and distinctive entertainment staged in real western mining style.

A distinctive feature of the convention will be the Exposition of Mines and Mining Equipment to be staged in a special arena directly opposite the State Capitol where the convention sessions will be held. Among the public exhibits will be an exhibit by the United States Bureau of Mines, which plans an exceptionally interesting demonstration of the rescue of miners in an explosion. This demonstration will be the first of its kind ever shown to the public. It will show a cross section of the underground workings of a mine, with miners in stoke and climbing the ladders from one level to another. One section will be sealed as a gas chamber, with spectators able to see what occurs within, through glass, including the manner in which mine gases affect miners. The Bureau has arranged to have safety crews break through with their safety apparatus, administer first-aid to the trapped miners and convey them to the surface for further attention. In this mine there will be displays of different types of mine equipment and adjoining the working demonstration will be demonstrated all the newest and latest types of safety equipment.

Approximately fifty of the leading manufacturers of mining equipment have already taken space at this exposition, which promises to be one of the most instructive and practical ever held under the auspices of the American Mining Congress.



Courtesy Colorado Springs Chamber of Commerce

Cathedral Spires, Garden of the Gods

An interesting feature of the convention will be an opportunity given to the delegates to visit, on Saturday, October 4, and Sunday, October 5, famous California resorts, famous mining operations and historic mining camps. The delegates attending the convention will have an unusual opportunity to select places to visit which interest them most and of going with their own parties and congenial friends as guests of the Depart-

ment of Mines and Mining of the Sacramento Chamber of Commerce and to see some of the most beautiful resorts in California's Resort Wonderland, and inspecting the remarkable mining operations on the Mother Lode and to see the historic old mining camps which have been such an important feature in the development of California as a state and the Nation as a whole.

The mining industry needs the cooperative effort of every mining man. The Sacramento convention offers a splendid opportunity for united effort along lines which will furnish a real stimulus to mining and which will be of the greatest value to all those interested in mining development.

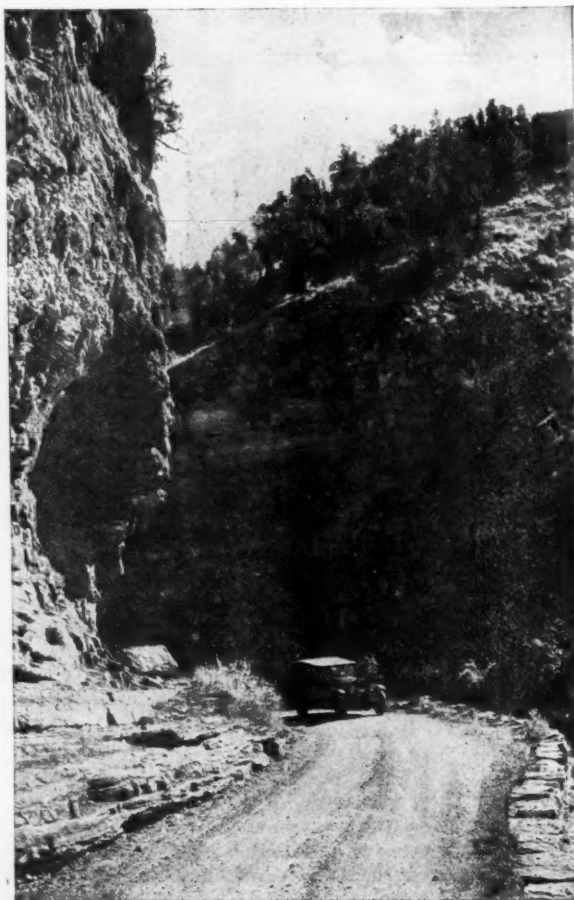
The program as arranged is of special interest to all mining operators in that it discusses the questions which are of vital importance to the industry.

In this year of political uncertainties the mining industry should concentrate its efforts to present a united front in meeting its difficulties and in solving its problems. The Sacramento Convention promises to be a great medium of cooperative effort, and the results of the deliberations are awaited with interest by the industry as a whole.

GRAPHITE

THE Department of Commerce announces that according to reports for the biennial census of manufacturers, 1923, the establishments engaged primarily in the manufacture of graphite in that year reported products valued at \$2,184,609, an increase of 49.9 percent as compared with \$1,456,864 in 1921, the last preceding census year.

In addition, graphite is manufactured to some extent as a secondary product by establishments engaged primarily in other industries. The value of the graphite thus produced outside of the industry proper in 1921 was \$141,911, an amount equal to 9.7 percent of the total value of products reported for the industry as classified. The corresponding value for 1923 has not yet been ascertained but will be shown in the final reports of the present census.



Courtesy Colorado Springs Chamber of Commerce

INTELLIGENT LAW-MAKING THE ONLY SOLUTION FOR INCOME TAX PROBLEMS

The Present Income Tax Law, With Modifications And Additions, Has Been In Existence Seven Years, Yet Our Tax Complications Grow Instead Of Diminish, Until Today The Burden On The Mining Industry Is Extremely Heavy And Mining Interests Are Endangered—The Next Session Of Congress Will Make Changes—But Will They Be Helpful?

By MCKINLEY W. KRIEGH*

FOR seven years we have been struggling with problems of income taxation—problems that have been acutely disagreeable because of an enormous tax burden that was made necessary by war. For seven years we have been groping for a plan that would simplify the law and that would make possible a satisfactory system of administration. Apparently, we are no nearer the solution of the vital problems of income tax administration than we were when the vast income tax organization was created. There are apparent reasons for this condition that we must recognize. And we must frankly and squarely admit that our income tax troubles have resulted, in large measure, from our inexperience with this form of taxation.

From an administrative standpoint the revenue law has become more technical and complicated with each new act that has been passed. Difficulties of administration are increased year by year as each new Congress adds new and revised administrative provisions to those reenacted from previous laws. As the law becomes more and more involved, administrative procedure becomes more and more difficult to follow. Likewise, the administrative machinery of the Government has become unwieldy and cumbersome in attempting to function under a series of comprehensive acts of Congress that overlap in their application.

When the matter of tax revision was taken up by the Committee on Ways and Means of the House of Representatives of the Sixty-Eighth Congress, three phases of the situation were to be considered; (1) the possible reduction of normal and surtax rates; (2) the simplification of administrative provisions of law; and (3) the closing of alleged gaps which supposedly gave opportunity for evasion of taxes. Surtax rates in the high brackets were unproductive and penalized investments in industry and business enterprise; administrative provisions admittedly were in need of simplification; alleged gaps through which wealthy taxpayers were said to be escaping taxes had to be stopped up.

But the Treasury draft of the bill for

revenue revision proposed to reduce surtax rates to a maximum of 25 percent. This aroused such bitter partisan opposition to the Treasury recommendations, known as the "Mellon Plan," that the question of surtax rates became the paramount issue in Congress and the matter of simplification was relegated to the background. The conglomerate mass of administrative technicality that was incorporated in the Treasury draft by the Department's committee on law revision was not carefully analyzed by the House and Senate, and numerous amendments were inserted by members of both houses, which not only further complicated the Act but made many of its provisions incongruous.

A COMPLICATED LAW

When the Revenue Act of 1924 finally was passed it was found that Congress had dealt primarily with rate revision and that the administrative provisions which are of so great importance, because they determine the amount of taxable net income, were more complicated and less practical than ever before. Not only does it appear that the Department committee on law revision went far astray in its efforts to simplify the law, but it appears also that an attempt was made to establish a *rule of thumb* measurement for every situation. If the framers of the 1924 act had been guided by a realization that the multiplicity of transactions in business requires a tax law that is flexible they might have formulated a system of administration that could be relaxed to allow the functioning of equity and common sense, and at the same time be narrowed to prevent tax evasions by devious technical subterfuges.

The attempt of the framers of the act to cover with scientific exactness every situation and condition affecting income that might arise in the conduct of business, was unsuccessful. The law, considered as a whole, was not simplified. Few, if any, of the Department's administrative difficulties were eliminated; but, on the other hand, new and intricate problems had been added. The effort to close gaps that permitted tax evasion also was unsuccessful, as the law with its

unparalleled net-work of technicality is replete with technical loop-holes that challenge the resourcefulness of those who are expert in taxation matters. Thus, the Revenue Act of 1924 affords little relief from provision problems of administration, and corporate taxpayers, Heaven help them, will find their difficulties greatly magnified when their 1924 returns are audited.

1924 ACT UNSATISFACTORY

I shall attempt to outline here some of the reasons why the Revenue Act of 1924 is not satisfactory, even to its authors. In the first place, it is too technical and complicated for the average taxpayer to understand even if he had time to study it, and few taxpayers have the time. In the second place, the rates of tax established by it represent a makeshift compromise and are not based upon sound principles of economics. In the third place, while it probably will produce sufficient revenues to meet the needs of the budget, the burden of taxation is not apportioned equitably among the classes of taxpayers to which it applies. In the fourth place, it imposes unjust penalties upon business by restrictions which prevent freedom of contract between taxpayers in certain transactions, the like of which, prior to its enactment and prior to the incidence of income tax laws, had been negotiated and consummated in accordance with accepted business methods and commercial practice.

The new regulations that are soon to be promulgated under this act will throw little light upon the situation. It is not improbable that many of the new regulations will be merely quotations from the law, without amplification or explanation. The interpretation of many provisions of the law therefore will await the prosecution of test cases, as in the past, to final decision through the long and tedious process of appeal, first to the Solicitor of Internal Revenue, then to the Commissioner, then to the Board of Tax Appeals, then to the courts. In the meantime, Congress undoubtedly will pass a new act, new regulations will be promulgated, and new test cases will arise. Thus, it is not unreasonable to assume that the possibility of early relief from administrative congestion is slight.

The surtax is a progressively increas-

* Address made before Conference on Mine Taxation, 27th Annual Convention, American Mining Congress, Sacramento, California, September 30, 1924.

ing tax, which ranges from 1 percent to 40 percent, beginning at incomes that exceed \$10,000. The Treasury recommended that the maximum surtax should be 25 percent on the ground that any surtax above that rate would be unproductive because taxpayers subject to the higher surtaxes would invest their capital in tax-exempt securities or else would find other means of keeping their taxable incomes within the lower brackets. The experience of the Treasury, backed by indisputable statistics, demonstrated that in many cases the higher brackets not only were becoming less and less productive of revenue, but in some cases had become barren. A further reduction of surtaxes is necessary, therefore, in order to make investments in productive enterprise attractive to accumulated capital. And this will continue to be an issue before Congress until the necessary reduction is made.

Statistics of income compiled and published annually by the Bureau of Internal Revenue show that the burden of taxation is not equitably apportioned among taxpayers of different classes. They show that the burden is now being borne chiefly by the man of initiative who attempts to make money under the usual conditions of business competition and that the present system penalizes principally the middle incomes (to paraphrase a statement of Mr. Andrew W. Mellon, Secretary of the Treasury, in his book "Taxation: The People's Business"). Mr. Mellon says that the vital defect in our present system is that the tax burden is borne by wealth in the making, not by capital already in existence. We who are engaged in the mining industry where our enterprises are constantly in a state of liquidation and must be kept alive by continuous development and by new discoveries, have had this truth brought home to us repeatedly. The mining industry has had to bear exceedingly heavy losses. The possibility of having the Government exact an unreasonable portion of the earnings of a mining enterprise that may prove to be successful, has prevented thousands of investors from investing their surplus funds in mining enterprises. This additional hazard has tended to make mining investments unattractive to those from whom the mining industry formerly was able to secure needed capital.

FREEDOM OF CONTRACT RESTRICTED

No previous revenue law has imposed such restrictions upon the freedom of contract as are imposed by the Revenue Act of 1924. It is unsafe now for any taxpayer to attempt to consummate a business transaction of any consequence involving the possibility of profit without first consulting with someone who is competent to determine the possible

effect of the transaction upon taxable income. Even transactions that have been consummated in the past are affected by the new law. Corporate distributions of accumulated surplus or in liquidation now involve a confusing and dismaying volume of technicality. The purchase, sale, exchange, transfer or capitalization of property are covered by intricate provisions of law that must be carefully analyzed and construed before the taxpayer can be assured of the ultimate effect of such a transaction upon his tax liability. The initiation incorporation or reorganization of a business cannot safely be undertaken in accordance with the usual business practice in such matters without the effect of the transaction upon tax liability being first ascertained. And, in many cases, ascertainment of the effect of a given transaction upon tax liability is impossible before consummation, and the matter must await determination by the department or decision by the courts.

LOOPHOLES FOR ESCAPE

A further enumeration of the defects of the 1924 act is hardly necessary to prove that simplification was not accomplished by that act. I shall not attempt to point out the many holes in the law, by means of which taxes may be avoided. Of course, no honest taxpayer wants to take advantage of a shady subterfuge to escape just taxation. It is not believed that taxpayers generally have ever intentionally availed themselves of so-called improper methods of tax avoidance for the sole purpose of escaping taxation.

Some of the changes made in the revenue law by the 1924 act, that the House and Senate committee reports stated were designed to prevent the avoidance of the income tax, were in the provisions of the reorganization section. These applied particularly to the mining industry. The report of the Committee on Ways and Means contained the following statement:

"The provisions of the reorganization section have been rewritten to prevent the use of the section to escape proper taxation by increasing the basis for depreciation or depletion or by increasing the basis for determining gain or loss from the sale of assets transferred in connection with a reorganization or by distributing as capital gains what are in effect dividends out of earnings."

There may have been a few cases where the provisions of the reorganization section were used to escape proper taxation. Such cases certainly were not numerous and probably were inconsequential in so far as their effect upon aggregate tax liability was concerned. Under the new provisions, however, not only are improper transactions affected but legitimate transactions are subjected to unnecessary scrutiny and uncertain

conditions that tend to obstruct the normal progress of business; and the problems of administration involved in this single issue are increased many fold. By imposing restrictions upon reorganizations of business enterprises and thereby preventing reorganizations in many cases where the enterprise could be refinanced and continued only by that method, the law probably has automatically shut off sources of future revenue, and the Government will undoubtedly lose many times more revenue than would have been lost through so-called tax evasion if the reorganization section had been left alone.

OUTLOOK DISCOURAGING

When the Tax Simplification Board recommended simplification of the revenue law in its report to the Senate in December, 1923, and the Secretary of the Treasury in his report urged simplification, and the President in his message said that revision of taxes should include simplification, and the leaders of both Houses of Congress said there would be simplification, it was thought that taxpayers would get some relief. The Tax Division of the American Mining Congress released several special bulletins to the mining industry that were extremely optimistic and were intended to encourage taxpayers. But with what taxpayers got in the 1924 act and with what they have in prospect in the form of another new act in 1925, we believe that the time has come when they should take a hand in the game and demand a square deal. Otherwise, somebody may lose what they have in the next shuffle, and that somebody is, logically, the mining industry.

I will repeat what I said in the September issue of the MINING CONGRESS JOURNAL: "A simpler tax law cannot be formulated and enacted unless taxpayers who pay the federal tax bill are given more consideration. Less than eight million persons are required to pay income taxes. More than twenty million persons pay no income tax and are not even required to file returns because of personal and other exemptions and deductions. If these twenty million are permitted to dictate provisions of the law, the rate schedules, and taxation policies (as they have to a degree in the past), it will be impossible for Congress to alleviate existing administrative difficulties."

ATTACKS UPON MINING INDUSTRY

The mining industry, as well as other industries, is confronted with a determined effort on the part of self-styled representatives of the more than twenty million non-taxpayers to have the excess profits tax restored, or, worse still, to have enacted a graduated tax on undistributed earnings of corporations. Undistributed earnings of mining cor-

porations generally are used for a reserve to cover seasonal fluctuations that involve operating losses or for exploration and development work in order that operations may continue without interruptions such as would occur if developed mineral reserves are exhausted before new reserves are located and blocked out. To deprive the mining industry of the use of undistributed earnings for these purposes would be destructive to the industry. Undistributed earnings and accumulated surplus frequently constitute the only factor of safety between solvency and bankruptcy. Therefore, the mining industry must be prepared to meet this issue effectively.

The mining industry is confronted with a possible attack upon the mining sections of the revenue law. So much propaganda has been broadcast, alleging improper administration of the mining provisions of the law, that the matter is being subjected to close scrutiny by members of Congress, including a select committee of the Senate. The industry has nothing to fear if the facts are made clear and the principles involved are understood; but unless representatives of the industry see that the facts are produced and that the principles of depletion and discovery are not ignored, misunderstood and misrepresented, the situation may become potent with danger. The future development and prosperity of the mining industry depend very largely upon the continued recognition in the revenue law of the principles upon which depletion and discovery allowances are based, just as the security of the farmer or the manufacturer from excessive taxation depends largely upon depreciation allowances upon his buildings, implements, machinery, equipment and other facilities through which his capital is returned for replacement purposes. Without these allowances, mining, agriculture and manufacturing, as well as other industries, and taxpayers would have to pay income taxes upon that portion of their annual earnings which represents a return of capital that will restore the full amount of their capital investments during the life of their properties that are being depleted or depreciated.

ARBITRARY TAXATION PREVENTED

The 1924 act has a number of good features. I would not have you believe

that the act is entirely devoid of changes that are beneficial to the taxpayer. One change that will serve to prevent much future litigation is that embodied in Section 204, Subdivision (b), which provides that cost or March 1, 1913, value, whichever is greater, shall be the basis for determining gain or loss from the sale of property acquired before March 1, 1913. Subdivision (c) provides that the same basis shall be used in determining de-

have been the case under the department's rule. By this change in the law, the department is prevented from arbitrarily establishing a March 1, 1913, value lower than cost in order to create a fictitious taxable profit.

There are few taxpayers in the mining industry who have not experienced difficulty in establishing March 1, 1913, value. And many valuations have been reduced below cost by the application of high risk rates and low discount or present worth factors. Section 204 (b) makes impossible the taxing of a return of capital by arbitrary estimates that reduce the March 1, 1913, valuation below cost. This result was accomplished by the convincing arguments and untiring efforts of members of the American Mining Congress General Tax Committee who appeared before the Treasury Department and the Senate and House committees. The justice of the amendment cannot be questioned. It applies with equal force to all other taxpayers as well as taxpayers of the mining industry.

THE BOARD OF TAX APPEALS

The American Mining Congress convention, held at Denver in 1920, recommended the creation of a board of tax appeals. The report of the tax committee urged "that the board shall be an independent body separate and apart from the Bureau of Internal Revenue and the Treasury Department, responsible to Congress only."

This recommendation was reiterated in resolutions of subsequent conventions. The revenue law made it impossible for a taxpayer to have his rights determined by the courts prior to payment of the tax assessed against him. The adjustment of tax liability for the wartime period seemed to drag along indefinitely. The income tax unit was congested with old cases and new claims and controversies were accumulating. To meet this situation and to enable taxpayers to secure a disinterested determination of tax liability, Congress finally created a board of tax appeals in the Revenue Act of 1924. And the act provides that, "The board shall be an independent agency in the executive branch of the Government."

Taxpayers are awaiting with interest the completion of the organization of the board and the evolution of its plans to the point where it will begin to function



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He May Have Trouble Getting a Pilot

pletion and depreciation on property acquired before March 1, 1913.

In some cases the original cost of mining property plus cost of exploration and development was greater than the March 1, 1913, value; but the rule of the department in such cases was that the March 1, 1913, value was the basis regardless of cost, and the taxpayer was compelled to pay a tax on the amount by which cost exceeded the March 1, 1913, value as well as on the amount by which the sale price or ultimate return exceeded cost. For example, the cost of a mining property acquired in 1910 and developed by A was \$400,000. The March 1, 1913, value allowed by the department as the basis for determining depletion or depreciation or gain or loss in case of sale was \$300,000. The sale price in July, 1924, was \$500,000. The taxable profit under the 1924 act, if no depletion had been sustained, would be \$100,000 instead of \$200,000, as would

in accordance with the purposes for which it was created.

Up to date, 12 members of the 28 provided for in the act have been appointed. These 12 are lawyers and accountants. Apparently, no engineers, mining or otherwise, have been considered for appointment, and no practical business men are likely to become members of the board.

Up to date, the board has devoted most of its time to the formulation of rules of procedure and practice. The rules promulgated thus far indicate that a judicial tribunal is being established instead of "an independent agency in the executive branch of the Government."

Up to date, the board has admitted only attorneys and certified public accountants to practice before it. The only qualification for admission to practice is a certificate of good standing as a member of the bar, or a certificate that the applicant for admission is a certified public accountant. Engineers are barred from practice. Men who have made a life study of taxation and who are especially qualified for the work of handling tax matters are barred, if they do not possess the required certificate. Even men who have been employed as experts by the department and by Congress in the formulation and preparation of the income tax statutes, such as Dr. T. S. Adams, are barred from practice before the board. The fact that they may have all other qualifications requisite for the proper presentation and prosecution of a tax matter makes no difference.

Perhaps we ought not to be too critical of the board while it is getting started. Perhaps we should reserve judgment on it until we have some tangible results in actual cases from which to form our conclusions as to whether or not it is going to carry out the will of Congress. But, on the other hand, unless we give expression to our views at this meeting, it will be a year before we shall have another opportunity; and it may be that if we state in no uncertain terms in a resolution of this convention just what mistakes we feel are being made, the board will have time to revise its mode of procedure before it becomes mired too deeply in an impossible task.

INCOME TAX PROCEDURE

Since our last meeting in Milwaukee in 1923 the Natural Resources Division of the Income Tax Unit has been abolished. The audit work formerly conducted by that division has been divided among the sections of the Personal, Corporation, and Consolidated Returns Audit Division of the Unit. The Engineering Division does all of the valuation work for the department, and this division will be kept intact. The change has not been effective long enough for mining taxpayers to be able to determine

whether or not any disadvantage will accrue in the final settlement of tax liability and the disposition of claims. One distinct advantage is apparent, however, which is that all of the audit and valuation sections of the unit are now housed under one roof so that they can be conveniently reached by taxpayers and their representatives who come to Washington for hearings.

It is for this conference to decide whether or not it should recommend the restoration of the divisional organization for the handling of cases of the natural resources industries, where the work of the auditors who analyze the accounts can be more closely coordinated with the work of the engineers who analyze the operations and know the properties. We believe that the Income Tax Unit should keep experienced natural resources accountants on the audit work of the natural resources industries. But a recent statement of Commissioner Blair, that "the determination of tax liability, once a valuation has been made, is no different in the natural resources industries than in other industries," would indicate that officials of the Bureau of Internal Revenue have an erroneous conception of the accounting problems of natural resources enterprises. And this might lead to the assignment of natural resources cases to any auditor in the Income Tax Unit who might be available for the audit work.

I shall not attempt to discuss in detail the procedure in the unit. However, the Tax Division of the American Mining Congress has been studying continuously the numerous problems of administration which confront the unit, and some results of this study have been submitted to the Commissioner of Internal Revenue. I shall not enumerate the recommendations that have been made, but the following excerpts quoted from a letter to the American Mining Congress from J. G. Bright, Deputy Commissioner of Internal Revenue in charge of the Income Tax Unit, will be of interest to this conference.

On the question of reopening closed cases for the redetermination of tax liability for the prior years involved, Mr. Bright said:

"Your comments with respect to reopening closed cases are in line with the aims and purposes of this office. Occasions have arisen and will no doubt continue to arise, however, where exceptions will have to be made, particularly if gross error or an element of fraud is connected with the case."

On the question of granting special relief consideration in unsettled excess profits tax cases without application therefor by the taxpayer in order to determine whether such consideration would result in a lower tax, he said:

"Under existing arrangements, cases in which invested capital cannot be determined are computed under the Special Relief Sections on the initiative of the department. This would seem to be as far as this office could go in extending the relief provisions of the statute, as Section 327 of the law contains the provision that the corporation should make application for relief, etc. To attempt to cause the department to apply the relief provisions of the statute voluntarily would throw an extraordinary burden upon the bureau, and in any event it is usually impossible for the unit to pass upon the abnormality existing without having the benefit of the information contained in the taxpayer's request for relief. In such cases proper administration of the relief sections without requests from the taxpayers would, of course, be impossible."

With respect to the possible publicity of confidential information submitted voluntarily by taxpayers to the department, Mr. Bright said:

"It is hoped that the publicity provisions contained in the law creating the United States Board of Tax Appeals will not tend to cause taxpayers to refrain from furnishing the explanatory evidence concerning transactions that has heretofore been given voluntarily. It is felt by this office that the execution of questionnaires and the submission of information requested by the department constitute a part of the proper rendering of the return as required by law. Thorough and cheerful compliance with all requests by the department for information is, of course, necessary if the taxpayer expects to have his tax liability correctly determined in the bureau without recourse to the United States Board of Tax Appeals or to the courts, and I believe that the institution you represent, as well as taxpayers generally, should continue the policy of cooperation which has been followed in the past and that they can do so without real concern with respect to the future use by the bureau of such information. So far as the unit itself is concerned, the taxpayers need have no hesitation in supplying full information as the Revenue Act of 1924 provides merely for the publication of a list of the taxpayers and the amount of tax paid. Confidential data attached to the return will not be made public unless it is accomplished in some manner over which the unit has no control."

The department was urged to discourage the tendency on the part of agents and conferees of the Income Tax Unit to raise new questions and demand new evidence in cases where the taxpayer comes before the unit for final hearing on questions previously raised. The introduction of new and sometimes incon-

(Continued on page 480)

BLASTING A NEW FACE ON NATURE

An Interesting Discussion Of The Marvelous Progress In Industrial Development Made Possible Through The Use Of High Explosives

By DR. CHAS. E. MUNROE*

BY THE aid of explosives, roads, many of great length and passing through rugged mountainous regions, have been and are being built all over our country, giving easy access to all parts of it and opening large areas of land to the occupancy and use of our rapidly growing population.

Among the more important of these roads, one might name the Columbia River Highway, 400 miles in length, passing through the Cascade range of mountains and disclosing most magnificent scenery; the Pacific Highway, now paved from the Canadian to the Mexican borders, and the Lincoln and Lee Highways, which, when completed, will join the Atlantic with the Pacific. The Needles Highway of South Dakota penetrates the very heart of the hills and opens to public view 14 miles of unusual needle-like granite formation of unforgettable beauty—a scenic paradise. The Federal Government is distributing many million pounds of surplus war explosives for use in building roads in each of the states.

It was in other avenues of transportation that the value of explosives was earliest recognized. The first application of gunpowder, of importance in this field, was probably at Malpas, France, during 1670-1681, in the construction of a tunnel 510 feet long, on the Languedoc Canal. The latest, and by far the greatest, example in this field is the Panama Canal where explosives were used on the most extensive scale ever known in canal construction.

With the invention of the locomotive by George Stephanson and the development of transportation by rail, the advantage of easy grades and direct routes was emphasized. From the beginning railroad builders have sought to remove obstacles and not to evade them. Hence from the beginning they have employed explosives with which to cut and fill or, where the overburden was large, to pierce. The

first railroad tunnel in the United States (driven in 1831 to 1838, on the Allegheny and Portage Railroad in



Blasting Nitrate Deposits in Chile

Pennsylvania) was 901 feet in length.

During 1854-1876 the Hoosac Tunnel, 4¼ miles in length, was driven through Hoosac Mountain, Massachusetts. Dynamite was extensively used in this work and a factory to supply the nitroglycerin was built at North Adams. During 1857 to 1872 a tunnel, 7.6 miles long, was driven through Mt. Cen's, and since then other tunnels have pierced the Alps. Today work is in progress on the Moffat Tunnel, 6.69 miles in length, to pierce the Continental Divide. It is to replace the 23-mile route by which the Denver and Salt Lake Railroad now surmounts the Rockies; reduce the lift on all that is moved by 2 400 feet, and eliminate the tremendous expense and numerous delays due to the heavy snowfalls encountered at this altitude. It is estimated that over 3,000,000 pounds of high explosives

and 323,000 detonators will be required in carrying out this project.

The longest of these transportation tunnels is short when compared with the 31 miles' length of the Croton Aqueduct, or the Shendakin Tunnel in New York's more modern system, 18.1 miles long, and said to be the world's longest continuous tunnel. In irrigation and water supply projects explosives play an essential part, not only in the driving of tunnels and general excavation work in difficult earth and rock formations but also in the building of dams. For it is by their use the rock for the base and the materials for the cement with which the concrete is compounded is blasted from the quarries and comminuted to workable size. At certain localities it has been proved feasible, by means of explosives, to blast large masses of material from the adjacent banks with which to dam the stream.

These dams, like the Roosevelt and Wilson dams, cause large areas of country to be submerged and artificial lakes to be formed. Through the damming of the streams in the Catskills, to form the Ashokan and the Schoharic reservoirs, storage for 128,000,000,000 gallons of water has been secured in the first, and for 20,000,000,000 gallons in the second mentioned reservoir. By such construction in inhabited regions large areas of farm lands, long occupied as homes, and even villages disappear.

Ocean transportation also makes its demand on explosives, especially in the removal of obstructions which menace the safety of vessels, and this demand becomes the more urgent with the increase in size, draft and speed of vessels. In the latter part of 1885 the residents of New York City were thrown into a state of consternation by learning that Flood Rock at Hell Gate in New York Harbor had been mined, charged with some 289,000 pounds of rack-a-rock and dynamite, and was to be blown up, and all man-



A Road Made with Dynamite

* Chairman, Committee on Explosives Investigations, National Research Council.

Courtesy the Explosives Engineer

ner of predictions as to the damage that would result, even to the entire destruction of the city, were made. The mine was fired on October 13, 1885, by little Mary Newton, daughter of the Chief of Engineers, U. S. A., but beyond the disintegration of Flood Rock, the production of a fountain of water over the area of the rock, which rose in some parts to a height of 160 feet, and a small tidal wave, no other obvious effects resulted. It did, however, give rise to an earth wave which was recorded as far away as Albany, N. Y., to the north, and Cambridge, Mass., to the east. Through observations on big blasts like this, Mallet, Milne, Omori and other experts have learned much as to the methods of transmission and behavior of earthquake waves.

The 289,000-pound charge used in demolishing Flood Rock was then the largest charge of explosives ever fired in a single blast, and it remained unchallenged until during the Great War the Germans started, just after the first battles of Ypres, the practice of mining the trenches. The British organized a special corps to meet this form of attack and in June 1916, some 227 mines were sprung on the British front. This form of warfare culminated on June 7, 1917, when the British sprung a mine at Messines Ridge charged with 933,200 pounds of high explosives. This was a tremendous amount but it was distributed in 20 charges, over a front of approximately 14,500 yards in length and the explosions occupied approximately 30 seconds, so it is hardly on "all fours" with Flood Rock. Referring in his "Memoirs" to this blast, General Ludendorff says: "The moral effect of these explosions was simply staggering."

More spectacular and hazardous was the blowing off of the top of the Col de Lana, a cone-shaped peak in the Dolomite Alps, and a pestiferous stronghold of the Austrian army (as planned and executed by Prince Gelasio Caetani, now Italian Ambassador to the United States, and his associates), with some five tons of explosive gelatine, by which the Italians captured that front.

The United States is perhaps the largest manufacturer and user of explosives. The Bureau of Mines reports that 529,727,859 pounds were used in this country last year. Also this is the country of large blasts. For years charges of 100,000 pounds have not been infre-



Courtesy the Explosives Engineer
Well Drill Blasting at Sacramento Hill, Arizona

quent. On February 16 last, 301,200 pounds were fired in the Lakeside Quarry of the Southern Pacific Railroad, 47 miles west of Ogden, Utah. On April 27 last, 364,000 pounds of dynamite were fired at the quarry of the Blue Diamond Materials Co., Corona, California. This was probably the largest movement in real estate in California since the earthquake and this charge of explosives now holds the World's record.

PUBLIC LANDS

THERE were 9,688 acres of public land reserved by applications under the Federal Water Power Act for federal power sites in Alaska, California, Colorado, Montana and Utah. Reservoir sites, consisting of 3,636 acres reserved under the act of October 2, 1888, were restored to the public domain in Colorado.

Nearly 20,000 acres of land in Arizona were included in a formal order designating the land as non-irrigable under the enlarged homestead acts and to that extent subject to entry as homesteads of 320 acres or less. Nearly 50,000 acres in Arizona, Montana, New Mexico and Washington were classified under the stock-raising homestead law and designated for entry in tracts of 640 acres or less. Much of the acreage involved in these designations is included in original entries or in applications under the enlarged and stock-raising homestead acts which confer a preference right.

About 4,000 acres of land in Colorado, previously reserved under the act of October 2, 1888, were restored to entry, and nearly 1,500 acres in Oklahoma and Utah were defined as within oil and gas structures under the act of February 25, 1920.

During August the Geological Survey reported upon the structural relations of lands embraced in 430 applications for prospecting permits under the oil sections of the leasing act of February 25, 1920, thus bringing the number of such reports rendered since the passage of the act to 25,803. Over 500 such applications were pending in the Survey, August 31, 1924. During the month reports were rendered on 14 applications for local prospecting permits and 14 applications for coal leases, making a total of 1,415 applications for coal permits and 585 applications for coal leases reported on since the passage of the act.—(U. S. Geological Survey.)

LEASED PUBLIC LANDS

THE production of coal from leased public lands of the United States located in various Western states is increasing rapidly.

A report compiled by the Bureau of Mines, which has technical supervision of coal production on these leased public lands, shows that a total of 1,249,878 tons of coal was produced from such lands in 1923. The ratio of growth of production is shown by the fact that in 1920 but 109,844 tons of coal were produced; in 1921 the production was 350,396 tons; in 1922 it was 805,337 tons. The total production for the first quarter of 1924 amounted to 392,542 tons.

Coal production from leased lands in Wyoming in 1923 exceeded the tonnages from leased lands in other states, the amount being 546,519 tons. Utah ranked second, with 211,300 tons; Colorado was third with 206,416 tons and Washington was fourth with 64,990 tons. New Mexico produced from leased lands 24,486 tons, Montana produced 14,991 tons and South Dakota produced 197 tons.

Since the passage of the general leasing act, 6,128 tons of phosphate rock have been produced from the one lease of this character in Idaho. There has been no production of oil from shale or of soda to date. The production of potash and associated minerals has been 922 tons.

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© National photo.

Mt. Vernon, the home of George Washington, a few miles below the Capital on the Virginia side of the Potomac

"While it stands, the latest generations of the grateful children of America will make this pilgrimage to it as to a shrine; and when it shall fall, if fall it must, the memory and the name of Washington shall shed an eternal glory on the spot"



THE DOUBLE TRACKED ROAD TO COAL SUCCESS

Whether The Industry Adopts Or Rejects Non-Unionism, It Must Employ Non-Union Methods—The Individual Must Seek Safety Through Improved Relations With Individual Buyers

By GEORGE H. CUSHING

ABOUT the most amusing chatter heard in a generation is that which, now, has to do with "saving" the coal industry. It is idle chatter because the coal industry has not been damned, condemned, lost, strayed, stolen or even mislaid. The coal industry is in no need of "saving" for the simple reason that it is wholly indispensable to America and to the world. On the latter account, it has not been in even momentary danger. The talk, therefore, of devising a general scheme of salvation is childish; the search for a Moses has been the offspring of blindness or of stupidity or both.

If, perchance, those who spoke of "saving" the coal industry intended to imply that they were going to prevent the bankruptcy of all of the coal companies, the pursuits partake of the nature of such games as hiding the thimble—mere amusing pastimes borrowed from the kindergarten. It simply can't be done. That is, certain persons rushed headlong—like brags—into the coal business when they thought it a sinecure. Instead, they found it a man's business and full of troubles. They are not equipped for the rough play which seems inherent in it. Now, too late, they are pleading for help. Society is not going to indemnify them for their mistake by assuring profits to such blundering and optimistic fools. They rushed into an unknown business; they now may, as precipitately, rush out of it. But, the idea of finding any general scheme by which they can stay in a misfit job and profit by it, is beyond reasonable powers of comprehension.

The temporary residence of these intrepid gentlemen in the coal industry has had about as wholesome effect as would a visit of a bull to a china store. While bankrupting themselves, they have visited ruin upon others who are legitimately in the coal business. If it is the latter situation which inspires the clarion cry for a scheme of salvation—and that seems true—there is some reason for the discussion. And that induces the statement that for these unfortunates there are but two possible roads out of coal's present dilemma.

One of those roads is the general adoption of the underlying principles of the non-union coal fields.

The other road is an offensive and defensive alliance between meritorious producers and sensible consumers of coal, in an ever widening circle.

Time is far too valuable to spend any of it in idle speculation as to whether

the Miners' Union will fall apart or will succeed in dominating the whole coal field of the United States. On that tremendous subject, equally convincing statements can be made on both sides. One might mull over them for the remainder of the day only to end precisely where he began—that no one actually knows which of the two is going to happen. And, it doesn't make much difference, in the end, which of the two does happen.

But, whether the coal fields become all union or all non-union, one result is inevitable—the principles to which the non-union operators adhere are those which must, in the end, prevail.

Again it must be said that precious time is not going to be spent arguing the well-known differences between these two systems of employing and dealing with labor. The essence of the difference—and that is all which naturally concerns anyone—is about as follows:

The union looks upon pick mining as the ideal. It rests its wage scale upon it. It adjusts all other wage schedules and working conditions upon it. Therefore, it believes—and acts on the belief—that the coal industry exists to give employment to men. Being dominated by that mood, it believes that the industry can be organized to force the people to pay what those men exact as society's contribution to their comfort and happiness.

The non-union field looks upon machine mining as the ideal, because it is in keeping with the spirit of the times. It bases wage schedules and working conditions upon it. Therefore, the non-union field looks upon the worker—skilled or unskilled—as an attendant of or helper to a machine. It seems to believe that the coal industry exists for the sole purpose of giving coal to the nation—of supplying a growing and expanding country with the cheapest power on earth. It assumes that for this work the people will pay both the operator and the miner a reasonable compensation for their work—if they can earn it. But, in the non-union theory, there are no guarantees in advance for anyone.

The union wants its members put on a pension for past performance.

The non-union field asks employment today on today's terms.

The union field wants to hold development in check so that it may force the granting of big pay for little work.

The non-union field strives for abundant development and hopes for a profit out of big production.

It is obvious, from the start, that no industry can possibly continue with those two ideas working side by side. They are so far apart that one or the other must, of very necessity, give way.

That statement is germane to the coal field only. It is a statement of conditions and theories in the coal industry alone. It may or may not govern conditions elsewhere.

The peculiar condition which the union has forced upon the coal industry is as follows:

When the union was—thirty-odd years ago—installed in the coal industry, most of the coal was pick mined—hand labor. Machines which were really effective did not come until almost a decade later. When even the crude machines were first installed the miners fought them. Later the miners' union admitted the machine and fixed, by agreement, the rate which the machine runner should be paid. *This rate was a given number of cents per ton—it varies with the district—below the cost of pick mining.*

That scheme, which is still in vogue, means that, no matter how effective the machines may become, the labor cost of mining a ton of coal can never be but a given number of cents per ton below what it would cost the operator to produce that coal by the most obsolete method. A genius might enter the coal fields tomorrow and produce a machine which would wholly revolutionize the method of mining. It might, because of its simplicity, be able to reduce the cost of extracting coal to a mere fraction of the present cost. Even so, if that machine were to be employed in a mine dominated by the miners' union, the labor cost of producing that coal would be the same as now—a given number of cents—not many—below the cost of doing the job by hand.

That explains, quickly and in a simple manner, why the cost of coal production in the union field has always risen proportionately with the increase in the miners' wage scale. The wage scale is always based on the cost of producing the pick mined coal. The machine differentials are then applied to the pick mining scale. Thus, the operators may have filled their mines with expensive machinery and may have wholly abandoned pick mining of coal but neither the operator nor the public has reaped any

more benefit than the few cents which measures the machine differential.

That part of the coal industry which is dominated by the miners' union, is tied by the leg to the pick, or hand, mining methods. And, it cannot get any benefit from the employment of the products of America's inventive genius.

The sharp contrast, now exhibited in all parts of the country, is that the non-union field has never given to the miners the veto power over the use of machinery. Those operators have reserved to themselves the discretion whether they will or will not employ machines. It is for them to say how the coal shall be produced. And, when they employ machines, they agree with the men who operate these machines what is to be a reasonable wage for their work. They do not ask and do not care what it costs somebody else to mine coal by hand. They, themselves, are not mining coal in that ancient fashion. They are mining coal by machinery. They are hiring men to run that machinery. They pay the men what that job is worth in their mechanically equipped mines. Then, if the fellow who wants still to use a pick, can meet their competition, he is welcome to all the business he can get. But, they are not going to keep up the costs in their machine operated mine to the point where the mossback can live while employing obsolete methods.

With that simple explanation, the statement is repeated that it makes no difference whether the whole of the coal field becomes union or non-union, the non-union method will prevail. There is a power outside the industry which will force the adoption of the non-union point of view upon this particular question.

In support of the foregoing rather strong statement is this one general consideration. The inventive genius of America did not exhaust itself when it provided a few machines for the economical mining of coal. It can, if it will, provide for other chemical reactions which will take the place of the union of carbon and oxygen. It is possible to force the price of coal up to the point where the inventive genius of the nation will be inspired to find a real substitute for coal. It is this power which will force the coal industry, in the end, to adopt the underlying principle of the non-union field.

Meanwhile, of course, the two principles, just described, are doing battle all over the nation. Half of our coal field is dominated by the union and held prisoner to its idea. The other half of the field is non-union and enjoys all of the liberty which its more liberal policy suggests. It is going to be an extremely difficult project to keep some of the necessary and deserving coal companies alive while the union idea is passing through the throes of death.

It would, but for one circumstance, be necessary to go even further and to say that it will be impossible to keep those other mines alive. The one circumstance in mind is that these deserving mines are truly necessary to the country at present on many accounts. Without entering any controversial question, but simply to illustrate, the State of Illinois is a first-rate example of what has just been said. The normal production of coal in Illinois should be, by now, considerably above 75 million tons per year. Illinois is dominated by the miners' union. It is flanked by union states—Indiana and Iowa—on the east and west. It has a non-union field to its south. It has a great coal consumption at home and a vast market immediately to the north which has no local supply of coal. In view of the geography of the situation, it would be nothing short of a national calamity to have the coal industry of Illinois wiped out and the Illinois and northern market stripped of the influence which that state has had and now has on the fuel problem in that large industry. Those consumers cannot possibly afford to have anything disastrous happen to the Illinois field.

Those consumers have as much vision as anybody else. They know now—they do not have, even, to be told—that the miners' union is done for. They realize, certainly, that the two divergent ideas herein exposed cannot possibly prevail side by side for any length of time. So, they know that it is only a matter of time until the whole system will be changed and a new order of things installed. When that readjustment shall have taken place, these consumers know that they will want and need the Illinois mines again.

Coming, now, quickly to the conclusion of the whole matter. The worthy coal companies cannot wait for popular support, until the vicious system imposed by the union has been wiped out. They must have business now—quickly. And, there is but one way in which they can get it. That way is for those who naturally supply the coal in any territory and those who naturally draw coal from a certain field to enter into an offensive and defensive alliance until the storm shall have blown over—and longer. This means, perforce, a return to those conditions which were interrupted by the war and the war making machinery—the dependence of the buyer upon a fixed source of coal supply and the dependence of the producer, for the major part of his business, upon a fixed number of consumers. This means nothing more than the mutual forming of a habit to rely upon each other—the most common thing in the whole history of business.

In these two ways, only, can the deserving portion of the coal industry work

out of the distressing situation into which the Jacksonville wage agreement plunged it.

COAL MINING LECTURES

A NEW course of lectures for coal salesmen on "Coal and Its Utilization" will be given during the coming night college year at Carnegie Tech in cooperation with the U. S. Bureau of Mines and an advisory board of coal mine operators and engineers.

The lecturers for the course will include faculty members of Carnegie Tech, experts attached to the Pittsburgh Station of the Bureau of Mines, and several mining engineers. The course will consist of 22 lectures given on Friday evenings of each week from October 17, 1924, to March 27, 1925.

The subjects of lectures to be given will include: "General Review of the Coal Industry," by H. H. Eavenson, Consulting Mining Engineer and C. E. Leshner, Assistant to the President, Pittsburgh Coal Company; "Elements of Chemistry as related to the Coal Industry," A. C. Fieldner, Superintendent, Pittsburgh Experimental Station, U. S. Bureau of Mines, (3 lectures); "Elements of Physics as Related to the Coal Industry," Dr. J. B. Nathanson, Assistant Professor of Physics, Carnegie Institute of Technology, (3 lectures); "The Manufacture and Utilization of Coke, with Special Attention to By-product Coking," C. J. Ramsburg, Vice President, The Koppes Company; "The Origin of Coal," Dr. C. R. Fettke, Associate Professor of Geology, Carnegie Institute of Technology; "Coal Resources and Markets of the U. S.," and "Coal Resources and Markets of Foreign Countries," Dr. Fettke; "The Economics of Coal Production," W. L. Affelder, Assistant to the President, Hillman Coal and Coke Company.

"Preparation of Coal for Market," Dr. H. F. Yancey, Associate Chemist, Pittsburgh Experimental Station, U. S. Bureau of Mines; "Combustion of Coal," H. W. Brooks, Fuel Engineer, Pittsburgh Experiment Station, U. S. Bureau of Mines, (7 lectures); "Getting the Most Out of Coal," (illustrated with motion pictures) and "Marketing of Coal as Related to Transportation and Quality," J. D. A. Morrow, Vice President and General Manager, Joy Machine Company.

WOOD UTILIZATION CONFERENCE

A NATIONAL conference on utilization of forest products has been called by Secretary of Agriculture Wallace to meet in Washington November 19 and 20. The use of forest products as mine timbers is expected to be considered.

TRANSPORTATION ILLS VANISH AS OPERATING EFFICIENCY IMPROVES

Practically Every Phase Of The Transportation Situation Shows Marked Improvement Over Conditions That Existed Two Years Ago—General Rate Investigation Proposal The Only New Legislation Favored By Mining Industry

FROM the standpoint of the producers and shippers of railroad freight traffic, the transportation situation in this country is excellent. Service has improved. Car shortages no longer exist. Equipment is in good repair. Large surpluses of box, stock, and coal cars are being held in reserve to meet the needs of shippers of freight, live stock, grain and coal during the busy fall season. Roadbeds have been improved. Train schedules have been rearranged during the last two years. Repair shops are functioning with greater efficiency than ever before. The railroads have placed on their lines thousands of new locomotives and hundreds of thousands of new freight cars. It appears that the large roads have made great strides toward recovery from the decline that took place during the period of government control.

Costs of operation and maintenance have been reduced. New capital has been procured for additions, betterments, and extensions. The retrenchment program of the railroads has been productive of immediate and beneficial results that are unparalleled in the history of railroad operation.

Of course, the earnings of the roads are not on a satisfactory basis. Notwithstanding the fact that carloading has been in excess of 1,000,000 cars a week, earnings have remained below the level necessary to keep the roads on a sound financial basis. But this condition is not likely to continue for an indefinite period. Earnings show signs of stabilization. Violent fluctuations, such as characterized the war period and the two or three years of business uncertainty and depression following the war, are no longer evident.

One of the principal causes for agitation in favor of the repeal of the transportation act, and a statute providing for compulsory consolidation of railroads, was that the facilities of transportation were not adequate to move commodities when they ought to be moved to the markets of the country and to points of consumption. It was alleged that the facilities of transportation restricted "not only the manufacturer, the farmer, and the mining enterprise, but also the merchant, the middleman, and, indeed,

every other business activity in the same degree." This is no longer true as to facilities. Whether or not it is true of railroad rates is, of course, another question. But as to facilities, the requirements of the country are being met successfully. Through co-operation of the shippers, the railroads, and the investors of the country, a stage of progress has been reached where it appears that facilities have been expanded, and will continue to expand from year to year, in keeping with the capacity of our industries to produce.

Voluminous reports have been filed with the Interstate Commerce Committees of the Senate and House of Representatives that deal with the transportation situation. These committees will make a serious mistake if they attempt to have enacted legislation that is based solely upon these reports which deal with conditions that no longer exist. It would be a mistake to enact legislation making consolidation compulsory, or to fix valuations on some basis other than a fair appraisal, or to revise the rate structure downward on some horizontal or other arbitrary basis, especially if present improved conditions should be ignored.

The proposal for compulsory consolidation is not dead. It is not even dormant. It is a live issue. For more than two years it has been offered as a panacea for transportation ills. Many conservative people believe in it. It will be considered by the next session of Congress. It may materialize into a bill that must be acted upon. Whether or not its passage can be secured depends largely upon the attitude of the shipping public.

The matter of valuations of railroads

also is a vital question. This issue has been muddled with confusing theories and radical propaganda. The controversy as to values is still in progress. It has had a tendency to injure railroad credit. The Interstate Commerce Commission has proceeded with great care and scientific analysis and investigation to ascertain the true values that shall be made the basis for determining what constitutes a fair return. The Commission's valuations are less than those claimed by the roads. They exceed the valuations which certain political leaders contend would be adequate. Commonsense reasoning ought to convince anyone who is not a radical, a theorist, or an opportunist that the Commission's valuations are approximately correct because the valuation work has been exhaustive, comprehensive and scientific. Therefore, if the Commission is to be continued, and it will be, as an agency of the Government, its findings in respect to railroad valuations should have conclusive weight against the superficial and wholly theoretical valuations of those who favor condemnation proceedings, confiscation of private property, and government ownership.

It is difficult to understand how Congress might legislate to reduce railroad rates on any other than an arbitrary, unscientific basis. Arbitrary, piecemeal, and unscientific methods of rate chopping have been disastrous in the past. Such methods have injured both railroads and shippers. The welfare of the transportation industry of this country is too essential to national prosperity to be jeopardized by experimentation and manipulation in the matter of rates. The other great industries of the nation are dependent for their growth and prosperity upon transportation efficiency.

And transportation efficiency can not be attained while germs of radicalism are permitted to attack the vitals of the transportation industry. The radical, the theorist, and the opportunist want to experiment with government ownership and operation. They want to manipulate railroad rates. And they want to inaugurate many other policies that portend hazardous consequences.

The mining industry has its rate problems. Its rate problems are a factor in its growth



Unloading Iron Ore on the Lakes

and expansion. But the mining industry has not supported the theory that rate problems can be solved through legislation of any character. Its leaders never have contended that freight rates should be reduced arbitrarily for the purpose of relieving the burden on its traffic. But the mining industry, through its spokesmen, has consistently urged the adoption of a plan of rate-making that would establish a scientific relationship between the rates on raw materials and the rates on products manufactured from those raw materials. Under this plan, the raw or basic commodity would bear a rate that would permit the largest possible production of that commodity and the greatest possible volume of traffic.

The railroads must have traffic in order to exist. Raw materials are the beginnings of traffic. Therefore, rates on raw materials might well be fixed primarily on the basis of what rate would permit the largest production of raw materials and would create the greatest volume of reserve or potential traffic. The theory of this plan of rate making is that as the raw materials are refined or manufactured into finished products, freight traffic on which proportionately higher rates can be charged, is created. Under this plan, commodities, at each stage of their refinement, would be subject to higher class rates and these rates would be based on a scientific and economic relationship between the raw materials and commodities transported during the process of refinement and finally in finished form. Some such relationship exists at present in the rate structure; but this relationship generally never has been analyzed for the purpose of determining its propriety. It has been passed upon by the Interstate Commerce Commission only in specific cases. In proceedings involving the general rate structure, it has been commented upon, but the Commission has considered a thorough investigation and analysis of the relationship between raw materials and refined or finished products too big an undertaking to be engaged in without special authorization and appropriation of funds for the purpose by Congress.

The cost of transportation is one of the largest items of expense in the production of basic materials. During recent years, many mines have been shut down because the freight rates were prohibitive. The normal market price of the products of these mines would not absorb the transportation cost and leave even a small margin of profit to the producer. The metal mines that have been able to operate under prevailing conditions were those that could

absorb the cost of transportation by producing a higher grade product, by cutting labor costs, or by consolidation with enterprises engaged in the refinement of the raw product and the manufacture of commodities derived from that product.

In the case of mines that have been compelled to produce their higher-grade product, there has been a wastage of reserves in the lower grades. In some cases, these lower-grade products, which once constituted reserves, are no longer possessed of any potential value, and therefore are lost to civilization. Where this has occurred, there has been a loss of potential traffic to the railroads, a loss of taxable wealth to the State, a loss of capital to investors, and a loss of raw materials to the manufacturer. Thus, wastage instead of conservation has marked the development of the mineral industries.

The railroads have recognized this situation to some extent. The roads serving the mining districts have, in many instances, elected to incur heavy losses during a period of depression in preference to causing a shut-down of the mines, and voluntarily have made necessary reductions in the rates on mine products. But the progress of rate regulation under the Interstate Commerce Act has made it increasingly difficult for the roads to act upon their own initiative in such cases and during such periods. And, since the Commission has declined to undertake an investigation of the rate structure which would make possible the establishment of a more scientific relationship of commodity rates, there appears to be complete justification for favorable action by Congress on the Hoch resolution which directs the Commission to make such an investigation and to make such adjustments in the rate structure between basic

raw materials and refined or finished products as the facts may warrant.

Beyond this, the mining industry has not favored new legislation. The mining industry desires no relief at the expense of the railroads or any other struggling industry. It is not believed that the railroads will oppose any investigation of the rate structure that has for its purpose the establishment of a more satisfactory relationship by the reduction of some rates and the increase of others, where their earnings are not jeopardized, but rather may be enhanced by the readjustment.

There is a feeling of dependence, of confidence, and of sympathy throughout the mining industry toward the railroads. The problems of mining and of railroading are similar in many respects and they have vital interests in common. Legislation that is inimical to the welfare of the roads is dangerous for the mines. Therefore, cooperation should be the rule and nowhere should the policies of one run counter to the policies of the other.

AMERICAN ENGINEERING STANDARDS COMMITTEE YEAR BOOK

THERE now exists the most widespread interest and activity in industrial standardization that has ever been shown, according to the new Year Book of the American Engineering Standards Committee.

The work of the committee is indicative of the growth of the movement as a whole. One hundred and fifty-two projects have been completed, or are under way, and in these various projects two hundred and thirty-five national organizations, technical, industrial, governmental, are officially cooperating through accredited representatives. The number of the individuals serving under various sectional committees of the different projects is nearly 1,100.

Of the projects which have reached an official status, 31 have to do with civil engineering and the building trades; 25 with mechanical engineering; 15 with electrical engineering; 4 with automotive subjects; 11 with transport; 1 with ships and their machinery; 14 with ferrous metals; 15 with non-ferrous metals; 12 with chemical subjects; 2 with textiles; 5 with mining; 5 with the wood industry; 1 with the paper and pulp industry, and 11 projects with topics of a miscellaneous or general character.

The Year Book may be secured by addressing the American Engineering Standards Committee, 29 West 39th Street, New York City.



SOME PROBLEMS OF MINE SAFETY

There Is An Enormous Amount Of Work Being Done To Promote Safety In The Mining Industry, But The Results So Far Do Not Seem To Warrant The Effort, But We Must Try Every Means At Hand And Not Be Discouraged Because We Are Not Immediately Successful

By T. T. READ*

ONE of the greatest problems in mine safety is the question as to whether all the efforts we of the mining industry are putting forth are really getting us anywhere. If the number of men killed, per thousand full-time workers in the metal mines, over the period 1911 to 1922, is plotted on a chart, there seems to be a steady decrease in the number of fatal accidents between 1911 and 1921, with the exception of 1917 when the rate was the same as in 1911. This is very gratifying, but in 1922 (the last figures available), the curve takes a decided upturn with nothing very definite to indicate the reason why. Breaking the accidents up into their causes, we find that the increase in 1922 over 1921 is chiefly in the accidents listed as miscellaneous, which was also true of the increase in 1917. Comparing the group figures for 1922 with 1911, we find that open pit, surface, shaft and explosive accidents show an encouraging decrease. Electricity and haulage (which form only a minor part of the total) are about the same, and falls of roof, which account for nearly one quarter of the total, show only a slight decrease. Turning to the coal figures for the same period, we find much the same situation—an apparent regular reduction in the accident rate up to 1920, then an increase from 1920 to 1922, which carries the total back to the level of 1911. Falls of roof and coal, which amount to about one-half the total, show surprisingly little fluctuation over the eleven-year period. The whole increase of 1922 over 1920 seems to be accounted for in falls of roof and coal, haulage accidents and gas and dust explosions; the other kinds of fatal accidents in coal mining seem to show little change.

When we come to scrutinize these figures more closely, we find there are a number of factors that must be taken into account, but whose effect cannot be accurately judged. Production rate evidently has some relation to the accident rate. If a man handles 10,000 bars of iron the chances are that he will drop a certain number of them on his toes. If he handles 20,000 in the same period as he formerly handled 10,000 he will drop twice as many in the period. In other words, the relation between chances of accident and time must be considered; where the chances increase

in a time period the apparent accident rate will increase although the hazard remains the same. Everyone knows that the production rate is increasing through the introduction of machinery chiefly, and if the accident rate does not increase accordingly it must be because progress is being made. But the matter



T. T. Read

is by no means simple, for if one man with the aid of a machine does the work of five men without a machine, who can say precisely what the effect will be on the accident hazard? The one man does the work that he did before in one-fifth the time, thereby reducing the time of exposure on a production basis, but the machine itself introduces some hazards that did not exist before. No one can say how much of the apparent increase in haulage accidents in coal mines since 1920 is due to the more general use of mechanical haulage, the speeding up of operations, and a variety of other factors that enter into the problem. Are more men killed when mechanical haulage is made? I, for one, do not know.

There is a statistical error involved in such comparisons which must be avoided and which can best be illustrated by an example from another field. Every once in a while somebody points out that cancer or some other disease is showing an alarming increase as the cause of death. It is evident that, since

everybody must die some time of some cause, if we suppress some of the causes the others must relatively increase. People who die of smallpox, typhoid fever, etc., do not have a chance to die of cancer. With smallpox and typhoid fever nearly abolished, cancer and other diseases, of which the prevalence has neither been decreased or increased, become more common as the cause of death. In the case of mine accidents it is not so simple, because they amount to only a small fraction of the total causes of death of mine workers, most of whom die of the same causes as the average of men. But it is evident that if a man is killed by a fall of roof he cannot also be run over by a trip, so that one cause of fatality has some effect on the other causes in a statistical summary.

Another source of confusion may be illustrated by quoting from the discussion of Mr. Bain's address before the Midland Institute of Mining Engineers, June 13, 1924. Prof. Douglas Hay of Sheffield University said: "Dr. Bain has somewhat stressed, for example, the fact that the death-rate per thousand tons of coal drawn in America is lower than the corresponding death-rate in this country. Now, speaking as a man who sometimes goes underground, I think my personal interest is in reckoning up the chance there is of getting hurt every time one goes below ground rather than in reckoning up the accident rate on a tonnage basis, * * *."

Now it is a fact that while the fatality rate per thousand of underground employees is three times as large in this country as it is in England, the rate per million tons of coal mined is about 15 percent less in this country than it is in England, or, in other words, a ton of coal represents less hazard to the miner's life in America than it does in England. "The chance there is of getting hurt every time one goes below ground" is a third thing and cannot fairly be considered without taking into account the question as to how many times it is necessary to go below ground to accomplish a given result.

The conclusion of the matter seems to be that mechanization of coal mines in this country is justified from the humanitarian as well as from the production viewpoint, since we produce a ton of coal with less loss of life than attaches to the production of a ton in Europe. No one can say how much loss

*Safety Service Director, United States Bureau of Mines.

of life would have attended the progressive mechanization of our mines if it had not been coupled with widespread efforts to promote safety in the mining industry, and therefore there can be no absolutely conclusive answer to the question as to whether these efforts are producing as much results as might have been expected. The best evidence seems to be the records of individual companies that have put on safety campaigns without otherwise changing their practice and have found that their accidents are reduced. The very complete records of the United States Steel Corporation indicate that accidents can be and are greatly reduced and the economic saving from their reduction greatly exceeds the cost of safety precautions.

In the past two decades surface transportation in the United States has been mechanized in a new way by the development of the automobile. It has been attended by an enormous number of deaths from this new cause; more than ten times as many each year as occur in coal mining. No one proposes to abolish the automobile, but attention is focused on well-directed campaigns to

reduce the number of accidents from their use.

There still remains the question as to why more than a decade of campaigning for safety has had so little apparent effect on the accident rate from falls of roof, etc., which is the most important cause of accidental deaths in both coal and metal mining. To my mind the answer is the same as to the question, why all the churches and preachers in New York have so little apparent effect in reducing the number of crimes committed in that city. Crimes are committed by individuals who do not go to church or listen to preachers; the two forces, on the average, simply never come into contact. Accidents from falls of ground happen to individuals who, on the average, are the only persons who could have prevented the accident. The careless or reckless individual is the one who is least affected by a safety campaign. How to reach the individual is just as difficult a problem in mining as it is in ethics; we must try every means at hand and not be discouraged at not attaining an immediate and complete success.

President of the Davis Coal and Coke Company, believes that "Industrial relations between labor capital and money capital, as an existing problem in the coal industry, does not differ in principle from that in any other industry. Coal mining, however, covers many separate and distinct operations and conditions of employment, varying with the field itself, the character of the coal, thickness and depth of seam, location of operation to large centres of population with relative advantages to the employees, as compared with the thinly settled, rugged and almost inaccessible locations, all being factors that affect the type of men employed or are available for employment, not only for coal mining and incidental labor but for management.

"As an illustration, in the thick seams of the thickly populated sections of Western Pennsylvania, it is probable that a full complement of mine employees and management can be secured of a type that would readily adjust themselves to a workable plan of industrial relations, while in the thin seam in isolated sections of West Virginia or Kentucky, the type of men possible to secure would be difficult to interest in or adjust to any such plan.

"Again, the question of cost must be considered. In the first case above mentioned, the operation of a very favorable plan might be measured in mills per ton, but in the second instance the adoption of a similar plan might involve an overhead charge on the industry of many cents per ton; and no matter how earnestly a corporation might desire to become a partner with its employees in a plan of industrial relations, the cost might prove a prohibitive factor. To my mind, therefore, a general, uniform plan of industrial relations in the coal mining industry is not practical.

"This applies particularly to the standardized industrial relations plan that so many writers, students, teachers, labor leaders, industrial managers and big business men have been unable to adapt, in a practical way, uniformly to all industry. Even were it possible to develop a workable plan of industrial relations, either for industry as a whole or for an individual branch of industry, such as coal mining, it would, because of the standardized nature of the plan, be so machine-like in its operation that it would gradually have the effect of repelling rather than attracting.

"Each unit of industry must meet its own situation on the basis of partnership in which stockholders contribute money capital, the workers contribute labor capital and the management contributes efficiency of administration. If these three factors can be incorporated into a working partnership, each recognizing the importance of the others, no other plan of industrial relationship will be necessary or helpful."

APPLIED INDUSTRIAL COOPERATION

*Two Views Of The Practicability Of Industrial Cooperation
As Presented By Mr. Louis S. Cates In A Recent Issue*

MR. LOUIS S. CATES, General Manager of the Utah Copper Company in a recent issue pointed out that "whether men are working for dollars or have their dollars working for them, they are all human beings and their relations are measured by human nature and human attitudes. Any plan for industrial relations adopted must aim not at the bargaining spirit but at the cooperative spirit, not at enlightened self-interest but at enlightened mutual interest. Any plan ought to be satisfactory which inculcates and develops a genuine desire on the part of all concerned to work out fair play and square dealing. Over the conference table each endeavors, through justice, to open not a way out but an avenue of mutual approach, so that the management, the subordinate officials, the foremen and the men come to see one another and the conditions of the organization as they are; and they arrive at a recognition of their mutual rights and mutual obligations."

The statements made by Mr. Cates have been discussed and approved by a large number of mining men. Mr. C. J. Hicks of the Standard Oil Company, believes that Mr. Cates has clearly "laid hold of the two essentials of proper industrial relations."

"We are all bound to agree that justice, the first essential mentioned by him, is indispensable to any satisfactory relation

between employer and employee. This does not mean justice to the employee alone, but justice to all concerned—employee, management, stockholder and the public.

"The second essential mentioned so clearly by Mr. Cates is one which has not been as generally recognized, but it is fast coming into prominence. This is the fact that the only way to insure justice is to provide a medium whereby all matters of mutual interest may be freely discussed and settled. No employer is quite wise enough to be able to fairly settle all such matters as wages and working conditions unless he has the cooperation and help of those associated with him as employees in making such determinations. The most hopeful feature in American industry today is the willingness of so many employers to recognize these two principles.

"Mr. Cates wisely points out the great need of some organization to take the place of the personal touch that has inevitably been lost in the larger industrial corporations. The Industrial Representation Plan is successfully supplying this organization. While this need is more apparent in the large corporations, yet my experience with smaller groups is leading me to feel that these groups also profit very materially by such a plan."

Some coal operators are not so hopeful for the success of any industrial relations "plan." Mr. A. W. Calloway,

SAFETY IN UNDERGROUND USE OF ELECTRICITY*

Paper Presented To National Safety Council Urges That Operators Consider Safety In Underground Electrical Equipment First, and Economy In Installation, Second—Many Recommendations Made To Prevent Accidents

By J. B. JOHNSON†

THE growing use of electricity in mining has led to a more strict consideration of safety in its various applications. The last decade of metal mining has witnessed more electrification developments than the entire century preceding.

The prime consideration in electric developments, no doubt, has been economy in operation, but as developments have progressed operators have become more and more insistent in demanding safety as well as economy. Today, in the consideration of proposed electrification for the major mining operations, the first question usually asked is, "Are all safety provisions for employees and property adequately covered?"

The first problems encountered in the electrification of a mine center about the safety of *transmission of power*. The transmission of electric power underground differs quite materially in methods from transmission on the surface. Underground clearances are, of necessity, very small, and special precautions must be taken in the insulation of main feeder lines as well as branch feeders. In the matter of voltage, safety would demand that nothing in excess of 6,600 volts be used underground. It is seldom, if ever, necessary to employ voltages over 6,600, and unless an underground transmission line is unusually long—say, over 2 miles—the standard line voltage of 2,200 volts is sufficient. Insulation of main feeder lines carrying 2,200 volts can be made perfectly safe if jute insulation with a lead sheath covering and flexible armor is used. This is a standard insulation and manufactured by all leading wire and cable mills and, although costly, will usually pay for itself in the prevention of a single accident due to short circuit or grounds. This method has the further advantage of being proof against moisture and being flexible, so that it can be anchored direct to timber sets or walls of tunnels and drifts. The metal sheaths are proof against stray induction currents, and a number of different feeders can be placed adjacent to each other.

A less costly method, consisting of the standard cable in metal conduits, is often employed but has many objections from the

standpoint of safety. Chief among these is the item of moisture from condensation within the conduits. Whenever local conditions necessitate such a method of installation, adequate provisions must be made for trapping the moisture and draining it off at suitable intervals.

In the splicing of armored cable special precautions must be taken, so as to make the splice as safe as the cable line. This is usually accomplished by using a short length of pipe of ample diameter to confine the splice and a reducing bushing at each end to close the ends of the pipe and at the same time allow the cable to pass through. The copper is spliced by soldering in the usual manner and taped, after which a good quality of insulating compound is poured into the pipe hot, completely filling it and excluding all air.

FEEDER LINES IN HOISTING SHAFTS

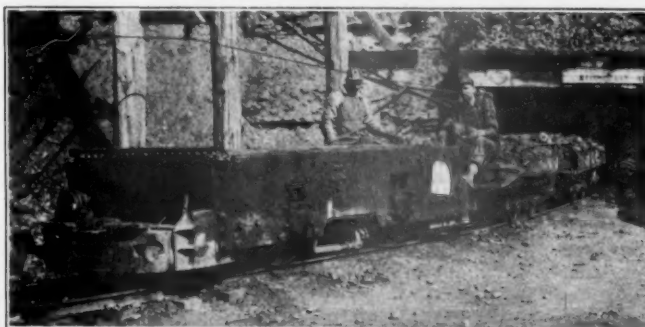
Every metal mine where ore is mined on different levels utilizes the hoisting shafts for the location of feeder lines that transmit power to the various levels. The problems encountered in the installation of vertical feeder mains, oftentimes several thousand feet long, are radically different from those met with in surface transmission lines. In the first place, it is important to secure the conductors to the sheath so as to prevent slipping when hung vertically. The wire manufacturers now make a lead-covered steel armored cable with bands every 8 or 10 feet apart which very effectually prevents slipping of conductors within the sheath when hung in a vertical shaft. The top anchorage must be made secure enough to support at least 800 feet of cable, and enough of the steel armor must be bent away from the cable to make an effective bond in the supporting clamp. Secondary clamps can then be

placed around the cable at every level to keep the cable in place in the shaft. The above method presupposes that the cable is suspended within a shaft compartment and has many advantages over any other. It allows for ready inspection through the entire cable length and greatly shortens the time in locating trouble from grounds. To prevent the communication of fire in the shaft the cables should be confined to a small fireproof compartment, or if the shaft does not permit room for this, the cables themselves can be fireproofed by covering with "gunite" cement or other suitable fireproof coating.

A less expensive method in concrete lined shafts is to cast conduits in the lining and suspend the cables in these conduits. From a safety standpoint, however, this method lacks much to commend it. It is open to the objection of condensation, before mentioned, and still more serious in vertical conduits is the liability of ground seepage getting into the conduits at some points with very destructive results when it is remembered that most mine waters are very corrosive. A recent case under the writer's observation was a concrete lined shaft with vertical conduits cast in the lining where cable had been suspended. After less than four years' service the entire cable had to be replaced, and it was found that there were a number of grounds all along the shaft where the insulation had been punctured. In this particular case the insulation was of rubber which is poor insulation material for underground use in a dry mine.

The foregoing discussion pertains particularly to all main feeders upon which the entire mine is dependent, and in completely electrified mines first-class construction is a prime requisite of safety, and next and fully as important is an absolutely first-class system of rigid inspection and testing at regular intervals. It is, therefore, necessary that construction men take into full consideration the items of accessibility for inspection as well as repair of all transmission lines.

The same precautions and care should be exercised in the case of distributing feeders as in main feeders, though in a lesser degree, perhaps, from the safety viewpoint. Connections of distributing lines to main feeders in a shaft



* Paper delivered Thirteenth Annual Meeting, National Safety Council, Louisville, Ky., September 29.

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are made in steel junction boxes in the same manner as in surface work. The box should always open on the outside of the shaft wall and into the station. The grounding of all metal armor and sheaths, conduits, boxes and transformer cases is as important in underground work as in surface work. However, this precaution is frequently overlooked owing to the underground difficulty of finding suitable ground connections. The safest method is to connect all ground currents to a continuous metallic return to the surface, either through shaft or tunnel, and connect up to a good system of grounding plates in a suitable location. This is far better than the all too common method of connecting to a water main or a pump column in the shaft.

In mine lighting, the standard voltage of 110 volts is employed. Lighting transformers, single phase, should be distributed and located in the mine so as to keep the voltage loss below a practical maximum as determined by economy rather than safety consideration. One hundred and ten-volt distributing lines can be run in conduit similar to surface installations.

VOLTAGE

In the various applications of electricity to underground operations, such as hoisting, haulage, lighting, pumping and ventilation, a safe rule is to run 2,200-volt lines direct without any transformation to all A. C. motors 50 H. P. or over. Since economy demands that transformers, rotary converters, and motor generators with low voltage secondaries be placed as close as possible to the load, it very frequently is necessary to place such apparatus underground. The case of lighting transformers has already been mentioned. In the case of transforming apparatus of 100 K. W. or more capacity, the question of dissipating the heat generated by such apparatus becomes an important item. This subject has not received the consideration which it deserves, and consequently there are many such installations in mines where the capacity is seriously curtailed because of overheated room conditions. It is essential in planning for such an installation for safety that a separate station for the equipment be cut adjacent to the main airway and a sufficient amount of air deflected through this station to cool the electrical apparatus. Overheated electrical apparatus is a constant menace to safety. The remedy is, of course, a regular inspection to guard against overloads as well as an abundance of ventilating air to carry away the heat. The most common causes of "blown" coils in motors, transformers and converting apparatus is insufficient ventilation, overloads and poor grounding of frames. As a further precaution against the possible spread of fire in a

mine, each set of transformers or converting set of 150 K. W. or more capacity should be placed in separate stations, as previously mentioned, and such stations must be fireproof and have quick closing air doors for quick isolation in case of accident.

Electric causes of mine accidents can be grouped under three main headings:

1. Failure of power, causing interruptions to service.
2. Overloaded lines or equipment.
3. Grounds and short circuits.

The first mentioned of these causes may not be considered as very serious in a surface plant but in a mine may have very serious consequences if protection against such contingencies were not provided. The hoisting of men and ore is the operation most vitally affected by this item, and therefore safety appliances for this class of service have received a great deal of attention. Automatic switches, magnetic and solenoid brake trips, and various types of emergency stop switches are being used successfully in connection with motor-driven hoists.

ELECTRIC HOISTS

Electrically operated hoists have so many advantages over other kinds, from the economical and operating viewpoint, that it remained only to make electric hoisting as safe as the older methods to make electric hoists entirely acceptable for mining use. It is true that there still exists some prejudice against electric hoists on the grounds of safety, but the development of safety devices that have proven absolutely reliable in years of service will soon overcome any prejudice that still exists. By means of very ingenious systems of wiring and safety devices, protection can be had against overwind, overspeed, low voltage and overload, and failure of power. Protection against overwind can best be effected by limit switches placed in the shaft itself. Overspeed can be prevented by a mechanical centrifugal governor geared to the hoist, the governor tripping the safety switch at any predetermined speed to which it may be set. Low voltage and overload devices operate in the usual manner through relays and trip coil to trip the main circuit breaker and disconnect the motor from the line. Failure of power also operates through the same circuit breaker with the same result. In hoisting operations it is, of course, not only necessary to disconnect the motor from the line but just as important to positively set the brake. This is usually accomplished by another set of relays and magnetic trip which, simultaneous with the opening of the main circuit breaker, sets the brake by tripping the gravity weight. All safety switches and devices which operate to stop the hoist are connected in series in

a separate low voltage relay circuit, and the disruption of this circuit at any point will operate to stop the hoist. This system provides protection against even the carelessness of the hoist engineer. A complete system of electric safeties for the protection of mine hoisting is very complicated and involves many ingenious details and can therefore only be touched upon here.

Continuous overload on lines and equipment underground should never be permitted and are a constant menace to safety even if the outward inspection does not seem to indicate any danger. A safety margin is always to be recommended. Periodic tests should be conducted to ascertain the loads on all important equipment. Peak loads due to hoisting will throw dangerous surges into the power lines if the proper precautions have not been taken in the control of the hoist motor. Unless conditions permit of a good counterbalance between cages or between cage and counterweight, it is not feasible to connect the hoist motor direct to the line. The peak of acceleration under most conditions is too great, compared with the running load, to allow for efficient operation of the system. It is considered the best practice today, on account of the better control, to drive hoists with direct current motors operated from motor generator sets with or without flywheel sets to equalize the peaks, depending on whether or not there be sufficient surplus capacity in the power line or in the power station beyond the line supplying the current. The control of direct current motors presents no difficulties to the engineer. In lowering heavy loads, full regenerative resistance in the motor is obtained at any speed, so that the brake need not be employed. It is not safe to lower heavy loads exclusively on the brake and many state laws will not permit this practice. In the case of A. C. induction hoist motors, full regenerative control is not possible except when lowering at a considerable speed above the rated hoisting speed in order that the motor may run above synchronous speed. When lowering at lower speeds it is necessary to "plug" the motor, a method which is not only wasteful of electric energy but not as safe as should be desirable. Sometimes conditions are such that balanced operation, as before mentioned, can be effected and the accelerating peak considerably reduced. Both efficiency and safety are thereby gained and the A. C. induction motor is fully justified. Dynamic or regenerative braking can, under these conditions, be made amply safe.

In any system of electric hoisting, the safe control of the hoist motor is a matter of prime importance. Smooth

(Continued on page 477)

STANDARDIZATION PROMOTES SAFETY

While It Is Admitted That Standardization Is A Great Ally Of Economy, It Is Not Generally Recognized That It Is A Big Factor In Mine Safety—This Paper Treats That Phase Of Its Value To The Mining Industry †

By RUDOLF KUDLICH*

THE standardization of mining methods and mine equipment has generally been recommended because of its bearing on the economics of mining. The manufacturer can produce a standardized article in large quantities much more cheaply than an equal quantity of articles of varying sizes and designs. The mine operator benefits financially not only by the reduced price of each article but also by many economies in operation and maintenance.

It is not often, however, that we think of standardization as a means of promoting safety. The standardization movement is not so old nor so general that we can quote statistics to show that it has resulted in a general reduction of accidents. We can, however, point to some instances where results are acknowledged. A company which introduced systematized or standard methods of setting props in all working places noted a material decrease in accidents from fall of roof. Another company found that by standardizing the mine tracks, room switches, etc., the haulage system was kept in better repair, derailments were less frequent, clearances were properly maintained, and rolling stock could be kept in better condition, all of which tended to reduce accidents in addition to accomplishing the desired aim of increased production.

Similarly, by standardizing the routine practices of operation wherever possible, output can be increased and the accident rate reduced. When a definite sequence of operations incident to the cutting, blasting and loading of coal, carefully planned to meet average conditions with due regard to safety, is followed, these operations are performed in safety and without the loss of time incurred by planning each step. We have many examples of the application of such principles in manufacturing, in construction, and in the building trades. In these industries conditions often prevail as variable as those met in mining, but systematized methods have been applied and the scheme found to be practical.

To mention a specific example, were a carefully worked schedule applied to the operation of the coal cutter, covering the unloading of the machine from the truck, setting jacks, making the sumping cut, etc., there would be no misunderstanding between the machine runner and his helper which might result in accident,

less time would be consumed in non-productive operations, and there would be little loss in efficiency in case it became necessary to break up a crew, since each runner and each scraper in the mine had followed the same procedure,



U. S. Bureau of Mines Photograph
Standardization of Switches and Rail Equipment Prevents Such Disastrous Derailments

and it would not be necessary for one or the other to change his routine.

Aside from such obvious examples of how accidents may be reduced, there are many others more or less indirect. For instance, if standardized equipment of a few sizes is used at a mine instead of a miscellaneous assortment, it is easier to maintain a supply of repair parts, and familiarity with one type makes repairs easier, with the result that defective equipment, the cause of a large part of our accidents, is more readily placed in safe condition. Similarly, were all mine



U. S. Bureau of Mines Photograph
Proper Bumpers on Cars Prevent Accidents Like This

supplies standardized, a broken or defective article would be replaced with less delay, because a new one could be substituted without making any other changes, as is often necessary when varied types are used. The less difficulty there is in making repairs, the more likely it is that repairs will be made without delay.

As has been the case heretofore, when introducing new ideas or new methods, it will, no doubt, be found that, though standardization in mining practices is recommended principally as a means of reducing costs, it will also yield appreciable results in promoting safety.

ELECTRICITY UNDERGROUND

(Continued from page 476)

acceleration and deceleration is necessary to safe operation, as is a complete system of automatic safeties. Apparatus for the control of hoist motors varies for every condition. Electrical manufacturers, cooperating with operating engineers, have developed control systems suited to every condition. This includes drum controllers, magnetic contactors, resistance grids, and liquid rheostat controllers, reversing contactors, all of which have been specially designed for underground use; also for the peculiar service incident to hoisting. Motors for hoisting service are also specially designed, as the standard types of motors are not suitable for this work. It may be added here that the success in electric hoisting has made it possible to install main hoists underground, of which a few have already been installed in this country.

Perhaps the most common trouble in underground power transmission is due to grounds. The only remedy for this prevalent trouble lies, in the first place, in a special emphasis on first-class construction and a choice of first-class and suitable insulating materials. Next in importance comes the institution of a good system of rigid inspection and tests at least once a month. Bare trolley wires for the haulage system should be protected on both sides with insulating material to clear the trolley and testing for grounds frequently made. Accidents from trolley wires are frequent but can usually be traced to carelessness of workmen or operatives. This latter cause of accidents we have always with us, and the only remedy is a persistent and thorough educational campaign in the interests of safety.

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SECURING COOPERATION OF EMPLOYEES IN SAFETY WORK*

Mr. North Defines Cooperation and Outlines Both The Workers' And The Executives' Place In Any Plan, At The Same Time Giving The Basic Principles Of A Satisfactory Result Producing Method

By HAROLD F. NORTH†

MUCH has been accomplished during the past 10 years in the protection of people from the outstanding hazards of industrial and civil life. When we consider the variety of safety devices designed to guard against even the most remote hazards, it would seem that all has been done that is humanly possible. Yet, in spite of these precautions, accidents continue to happen with alarming frequency. Accident statistics show that, to a certain degree, mechanical perfection has been reached in the prevention of accidents. If this is true, the element which predominates in the causes of accidents is a human one. Here is our problem. How can it be solved? Who shall solve it? The solution is found in cooperation, and cooperation is the job of every last one of us.

We want to secure the cooperation of employees in safety work. Before we can begin to do this we must know two things about cooperation:

1. What does cooperation mean?

Webster has given us a definition, "to act or operate jointly with another or others." Assuming that we know our problem and goal, this means a concerted action toward a common end.

One of the most difficult things for man to understand is the other fellow's "point of view." If we ever hope to realize cooperation, even in its vaguest sense, we must know our fellow man's viewpoint, understand it, and accept it for its full value. Too many times we fail to do this and, in doing so, blame the other fellow for a failure to cooperate. We should have a mutual understanding of the problems whose solution make for safety.

2. Who are the employees we want to cooperate?

When we speak of employees we generally create in the minds of many people a picture of the man who labors and rarely, if ever, do they think of the man who decides or passes on an order as being one of the same group. The man who labors at a skilled job or an unskilled one cannot cooperate without someone to cooperate with; nor can anyone else. He must cooperate with his foreman, with the safety committee or engineer, with the medical department; and they all must cooperate with the executives. The executive, though not generally considered an employee, is in a

sense one and for our purposes here let us consider him as such.

Each of these persons or groups has a definite responsibility to the others, and it is only when this is recognized that cooperation in the true sense of the word can be achieved and accidents prevented.

It is my purpose to present some idea of the functions and responsibilities of the several industrial groups concerned in safety work and the value of education as a means of securing cooperation.

THE EXECUTIVE'S PLACE IN SAFETY

In the early days of our industrial system, organizations were so small that the executive was closely associated with the workmen. He knew their strong points and their weak points. Moreover, he knew the details of their jobs. With knowledge of this kind he was in a position to promote safety first hand. If one of his men was injured, he immediately took personal charge of the case. Close contact prevented many phases of modern industrial relations from assuming the serious nature which they exhibit in the complexity of industry today if, indeed, they appeared as problems at all.

Our industrial system has changed, but I don't believe the spirit of the executive, which made possible this close association, has changed one particle. What has happened is that industry has grown to such proportions that where hundreds were employed, today there are thousands. The increased responsibilities of the employer have removed him from close contact with his workmen by placing between them a large number of subordinate executives among whose duties and responsibilities is that of perpetuating the interest in the safety of the employee that existed when the organization was not so large. Even these subordinate executives are removed from the actual conditions which cause accidents, and so we have the introduction of the safety engineer, safety committee, and medical department, who along with the foreman, are charged with the big responsibility of promoting safety.

What, then, is expected of the executive of today? He must coordinate the activities of these various groups. He must maintain an interest in safety work, and by the example of his action in all matters pertaining to it, show that he is an ardent supporter of safety. There is nothing more discouraging to

those actively engaged in safety work than failure on the part of the executive to give serious consideration to and take prompt action upon a recommendation, even though it may not be approved. Procrastination is evidence of lack of interest, and that is not a part of cooperation.

THE MEDICAL DEPARTMENT

The medical department, while not very large, has indeed a large responsibility. Very often it is looked upon only as a place where injuries are treated. While this is its primary and immediate work, we cannot overlook the possibility which the performance of its function and the trained personnel of the department offer in the promotion of safety. For example, this department can and should examine applicants for employment. Such examination aids materially in placing employees in jobs which they are physically able to perform. This means working with the employment office, getting a record of all persons employed, examining them, and reporting the results of such examination to the employment manager, who must then place the man accordingly. The ideal time for such an examination is before the man goes to work, although in many places examinations are made the first or second day of employment.

In the treatment of injuries the medical department can learn from the injured person everything about how the injury occurred and the type of work which he was doing at the time. This information, with at least excerpts of the original examination at the time of employment and the recommendations then made, should be passed on to the executives and safety engineer or committee for study and action to prevent a similar accident from occurring in future.

Work of this kind by the medical departments undoubtedly will bring a reduction in accidents, and certainly will have an effect in minimizing the seriousness of many others which will continue to happen.

THE SAFETY ENGINEER OR SAFETY COMMITTEE

Whether the direct responsibility for the supervision of safety work should be placed in the hands of one man or a committee depends largely upon the size of an organization and the nature of the hazards which it involves. Some organizations have a safety engineer and a safety committee as well, while others have one without the other. While in

* Address delivered to the National Safety Council, Thirtieth Annual Meeting.

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some respects they are equally useful, each has its own advantage over the other. The safety engineer has the advantage of his training in the location of hazards and guarding against accidents. The committee, usually made up of men of long standing in the organization, has the advantage of familiarity with local conditions.

Safety committees are formed in several ways. Some organizations select them from among the local executives, while others select them from the ranks of the workmen. Either of these methods produces good results if the committee is active and supported, but a combination of local executives and workmen, including the safety engineer if there is one, seems to work out best. A committee of this kind usually comes to an agreement based upon the impressions of two groups which view the problem from different angles.

The duty of a safety engineer or committee is to investigate conditions under which men work, locate the dangers and devise means for protection from them before accidents occur. All accidents should be investigated by them separately or by classified groups. From information of this sort, combined with the reports of the medical department, they will be in a position to compile data that should be invaluable in the cause of safety.

Casualty companies are constantly preparing data on accidents for the purpose of determining rates. It seems that the packing industry has not yet fully recognized the use they could make of information about accidents which occur in packing plants. Some of the forms of classifying accidents are by causes, distinguishing between mechanical and human as fully as practicable, and by location of the injury, by occupation, hour of occurrence, length of service, age, nationality, literacy and illiteracy of the injured.

It is almost impossible to get any definite information, that would be of value in general or specific accident prevention work, from the study of single cases. But when enough cases have been recorded in any or all of the classes we have just mentioned no matter what the average of these cases proves to be, certain places or groups will prove to be exceptions to the average. And it is through these exceptions the safety men and management are able to form definite conclusions about certain causes and determine the action necessary to better the situation.

To illustrate the thought I want to leave

with you, let us suppose that in one of our plants we have made a classification of accidents. The results show that 30 percent of all accidents are caused by handling objects, 27 percent through the use of hand tools, and 15 percent by falls of persons, with the remaining 28 percent accounted for by eight other different causes. Now going a step further we find that in one department handling objects caused 65 percent of its accidents. It is also found that men between the ages of 20 and 24, and of certain nationality, are most likely to be injured.

Here's what these figures tell us and the effect they have on securing cooperation. In the first place we see that the outstanding causes of injuries are "handling objects" and "hand tools." We must, therefore, direct general safety activity and propaganda with a view to eliminating these causes. Secondly, it has shown the place where this particular cause is most frequent and enables the safety men to act against a specific cause. Third, it points out those persons in the department who are most likely to injuries through these causes. Fourth, it may result in investigation that will show some method or practice in the department is responsible for the high rate.

With this information, the safety committee, or some designated person can arrange a meeting, to be attended by all persons of this department, whose age or nationality place them among those most likely to be injured. They can then be told what the outstanding cause of injury to them is; that they are a group in which, the figures show, workmen are most frequently injured by this cause; how they can guard against such injury.

WHAT WE SHOULD EXPECT OF A FOREMAN

It is the foreman who makes for safety or the disregard of it by the workman. For many years the job of the foreman was looked upon as one to be occupied by a man whose only responsibility was for standard of quality at minimum cost of operation. While this is a most important phase of his job, the foreman is in a position which makes him invaluable as a safety booster. He is the contact

man between those people to whom accidents most frequently occur and those who are otherwise interested in the prevention of accidents. It is around the foreman that the major part of cooperation is built. No matter how capable or active the other groups may be, their effectiveness and success is affected materially by the attitude and action of the foreman.

Now, if the foreman is in such an important position, for what shall we hold him responsible? He should make frequent and careful inspection of conditions in his department. This includes machines, tools, and miscellaneous equipment such as trucks, tables, etc. The condition of buildings with particular reference to the flooring, floor loads, condition of joists and rafters, is quite important and should have the careful and constant attention of the foreman. Thought has to be given to the lighting facilities of the department, and all places where men are at work or have occasion to travel must be well lighted. Inspections of this kind will bring to light numerous hazards that result from wear and tear on equipment. The good foreman knows what machinery in his department is dangerous when out of order and has it overhauled as often as necessary to keep it safe to operate. He also sees that safeguarding provision is made and maintained.

What we have said of the foreman's job so far has had to do with the care of equipment in his department. He has another responsibility far more important in the matter of safety which is more likely to be overlooked than the equipment. It is to *devise safe methods and make safe assignments*. We must get the foreman to study the methods of his department to make them safe just as earnestly as he studies them to increase production. He must realize that men are not equally qualified either physically or mentally to do a job with safety as well as skill, and then assign men to work which they are physically able and mentally proficient to perform.

Finally, the foreman should learn the lesson taught by every accident in his department, giving the necessary study and taking the necessary action to prevent a similar accident from happening. Prompt and interested attention should be given to all injuries, no matter how slight, to prevent their serious development. This is really difficult for the reason that many men neglect slight injuries, such as scratches and nail punctures, because of either a false sense of pride or loyalty. The foreman should make the



men under him feel that to stop to have an injury treated is good sense rather than weakness for which he may be joked about by his fellow men in the department.

The employe on the job must be made a safety man through education. Almost without exception, the new employe is hired with little or no knowledge of standards and quality of production he will be required to meet, much less a knowledge of hazards in the department. It goes without saying that he will be carefully instructed about the former and repeatedly checked up to see that his work meets requirements, but there are very few foremen who will take a new man aside and show him the places or practices where danger lurks in spite of guards, and how to avoid injury; who will encourage him to be constantly alert in looking for conditions which may cause injury to himself or fellow men, and report such conditions promptly to the proper persons; who will spend a few moments advising the man how to treat accidents he may sustain, even though they may be slight; and where he may get medical attention. Failure on the part of foremen to take proper interest in the treatment of injuries has ruined more than one man's respect for safety work and will continue to do so as long as it is practiced.

The foreman who does instruct the new man, encourage him to see and report unsafe conditions and practices, and takes an interest in having injuries treated, will certainly find cooperation on the part of the workman and fewer accidents in his department. It has been well said and many times demonstrated that the attitude of the foreman in matters of safety is reflected in the practices of the men who look to him for instructions. This is a means of creating an interest in safety of fellow men, and report such conditions promptly to the proper persons; in the mind of an employe at the very outset of his association with his job and the first step in making him a safety man.

Once the interest of the man is aroused, it can be kept active through safety campaigns, the use of bulletin boards throughout the plant for displaying illustrated bulletins and safety slogans, and above all by sincere interest and action at all times in safety work.

When you find a place where the executive supports all safety work and reports with prompt action; where the medical department gives thought and study to the causes of accidents, as well as to the treatment of them; where the safety committee or engineer is working for the elimination of hazards as well as for their discovery; where the foreman is thinking of the methods of his department from a safety standpoint and giving thought and time to the instruc-

tion of new employes about safety and the presence of known hazards; where steps are taken to maintain an interest; there you will find a place where the employes have begun to cooperate.

GASOLINE QUALITY

DESPITE the general tendency of motorists to criticize the quality of gasoline, the tenth semi-annual survey by the Department of the Interior indicates that, on the whole, a better grade of gasoline is now being marketed than was offered for sale during the same season a year ago. Of the ten cities in which the survey was conducted by Bureau of Mines chemists, San Francisco ranked first in the average quality of marketed gasoline. Washington was the second city in this respect, with New York running a close third. The other cities in which gasoline samples were collected were Pittsburgh, Chicago, New Orleans, St. Louis, Denver, Laramie, Wyo., and Bartlesville, Okla. In collecting samples for examination the Bureau of Mines men visited filling stations and wholesale distribution plants, endeavoring to obtain as representative a collection of gasoline samples as possible.

The survey, representing typical gasoline marketed in July, 1924, substantiates the findings of the July, 1923, survey, which showed an interruption in the gradual tendency toward greater uniformity in the character of gasoline marketed in various sections of the United States, which had been indicated in the surveys made from July, 1917, to January, 1923. This tendency toward uniformity had been arrived at by averaging end points of the 10 percent of the least volatile and most volatile samples of gasoline. The difference in average end points, which amounted to 115 degrees in April, 1917, had decreased to 54 degrees in January, 1923, and rose to 61 degrees in the recent survey.

Of the 146 samples of gasoline collected in the ten cities, 76 failed to meet in one or more points the Federal Government specification for motor gasoline. In the mid-summer survey of 1923 of the 158 samples collected 109 failed to meet the Federal specifications. A contrast of the figures for 1924 and 1923 in this respect bears out the general conclusion that the 1924 summer gasoline averages a better grade than the 1923 product. The departure from federal specifications in the majority of gasoline samples analyzed this summer does not exceed a few degrees.

LAW MAKING AND TAX PROBLEMS

(Continued from page 466)

sequential issues by the unit conferred frequently has been the cause of aggra-

vating delays on the part of the taxpayer and also the cause for his requests for additional hearings. On this point, Mr. Bright's comments are reassuring. He states that:

"So far as the unit is concerned, every effort is being made to confine the final hearings to the questions at issue at that time, but, of course, if the taxpayer or his representative brings up new issues, it is necessary for the unit to make sufficient inquiries into the issues thus raised to determine the merits of the case."

These matters are outlined here in order that you may know what the Tax Division of this organization is doing at Washington. You may not be able to point to any direct benefit that you have received from our efforts to have the administrative procedure of the department simplified; but tangible results of a beneficial nature, affecting the entire taxpaying public as well as the mining industry, are accruing, and they will be evidenced soon by the facility with which new cases and claims are disposed of as soon as the volume of back work is out of the way. Even the accumulated work of prior years is being disposed of with greater facility than was possible under the old system of administration. The present officials of the bureau are deserving of a great deal of credit for the reforms in administrative procedure that have been inaugurated during the last two years.

The task before the Bureau of Internal Revenue is gigantic. If there continues to be enacted a new and more complicated law every two years, there will be little chance for relief from congestion in the bureau or for improvement in administrative procedure. The creation of new administrative problems without any relief from present problems may be expected logically to result in a complete breakdown of the administrative machinery of the bureau. Congress alone has the power to take the action necessary to relieve both department and taxpayers from administrative burdens that have, for the most part, resulted from fundamental defects in the law. Observers in Washington generally are of the opinion that the bureau is doing the best it can with an unusually difficult and intricate task. It is pleasing to note that the Senate Select Committee on investigation of the bureau is now proceeding with its work with a view to finding ways and means for securing the elimination of complexities in the law that are responsible for the unsatisfactory conditions that have prevailed. If Congress, the department, and taxpayers will cooperate in bringing about changes in the law that will enable administrative rules and regulations to be simplified, the income tax law will be less onerous and its administration will become less difficult.

PROTECTION OF MINE TIMBERING FROM FIRE*

Since It Is Impracticable To Dispense With Timber In Mining It Is Only Common Sense To Recognize Such Hazards As Are Attached To Its Presence In Mines. This Article Outlines Possibilities For Fire Prevention And Timber Preservation Through The Utilization Of The Several Known Methods

ONE of the ever-present hazards in mining is fire. A mine fire is especially dangerous, as the smoke or flame frequently cuts off exits through which the men must seek escape, trapping them underground. Fires that originate in or near shafts and shaft stations are particularly to be dreaded, as the gases and smoke may spread through the mine and cause great loss of life, even though the fire itself be a small one. The Bureau of Mines† in various publications has called attention to the dangers of shaft fires, methods of combating them, and the need of making these points as impregnable as possible. A few disastrous shaft fires are mentioned below:

On November 20, 1901, 35 men died at the Smuggler-Union from a fire in the bunk house at mine entrance. The Fremont shaft fire, November 30, 1907, killed 11 men; the Belmont mine fire, Tonopah, Nev., February 23, 1911, 17 men; the North Butte shaft fire in June, 1917, 163 men; the El Bordo shaft fire, in March, 1920, 77 men; the Argonaut shaft fire in August, 1922, 47 men. Great loss of property and expensive delays have been occasioned through fires at the Ward shaft, Virginia City, Nev.; Belcher shaft, Gold Hill, Nev.; Sutro Tunnel, Virginia City; the Anaconda mine, Butte, Mont.; Homestake mine, Lead, S. Dak.; Calumet and Hecla mine, Michigan; United Verde, Jerome, Ariz., and Sunnyside mine, Sunnyside, Colo. In July, 1924, fire in the Eureka shaft at Globe necessitated shutting down for several days, this mine and several adjoining mines having interconnecting openings.

*Published by permission of the Director, Bureau of Mines, Department of the Interior.

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‡Rice, G. S., Mine Fires, a preliminary study, Bureau of Mines, technical paper 24, 1912, 50 pp.; Paul, J. W., Mine Fires and How To Fight Them, M. C. 10, Bureau of Mines, 1916, 14 pp.; Higgins, Edwin, Fires in Lake Superior Iron Mines, technical paper 59, Bureau of Mines, 1913, 34 pp.; Harrington, D., Lessons From the Granite Mt. Shaft Fire, bulletin, Bureau of Mines; Harrington, D., Pickard, B. O., and Wolfen, H. M., Metal Mine Fires, technical paper 314, 1922.

By HARRY E. TUFFT†

The principal sources of ignition in mines are sparks from electrical equipment becoming deranged, miners' open lamps, matches, burning fuse and flames of explosives in blasting, spontaneous combustion, and incendiarism. Fires from spontaneous combustion have generally had their origin in pyritic or carbonaceous ores or rocks, stable refuse

mine fire once attains much headway, the intensity of the heat will burn wet mine timbers as well as dry, whether the timber is treated or untreated or whether it is closely or openly placed.

The difficulty and expense of controlling serious mine fires is well known. In the consideration of fire protection, it is of prime importance to take steps to reduce to a minimum the possibility of a fire getting started, and to provide facilities for promptly extinguishing any

incipient fire before it gains headway and becomes a menace to the safety of the men and the mine.

Since it is impracticable to dispense with timber in mining, it is only common sense to recognize such hazards as are attached to its presence in mines. In the following paragraphs are pointed out some of the places where timber may be advantageously replaced with non-inflammable materials, where the timbers can be practically protected

by a fireproof coating; and precautions for reducing the possibilities of igniting timbers in workings where timber is exposed.

SURFACE PROTECTION

For structures directly over the mine opening, no timber should be used. Fortunately, at metal mines headframes of steel and reinforced concrete are becoming common practice, although in a few regions the inflammable wooden type is still seen. At coal mines, steel is now commonly used for tippie construction, although some tipples are of concrete.

In the Lake Superior metal mining district, which was visited by the writer in 1922, reinforced concrete and steel headframes were observed at a number of underground mines. Some of these are described in greater detail by Best. At the Cliffs A and B shafts, Ishpeming, Mich., the old wooden shaft houses were, in 1919, replaced by twin shaft houses of reinforced concrete. The headframe of reinforced concrete of the Curry shaft and the headframe of reinforced con-



U. S. Bureau of Mines Photograph
Timber Treating Plant, Treated and Untreated Timber in the Foreground,
Homestake Mine, Lead, South Dakota

and oil-soaked waste. Timber rarely ignites by spontaneous combustion, although timber in old filled workings, mats of caving systems, and other places where large amounts of timber may be present in finely broken rock, will readily burn from heating of pyritic or carbonaceous ores and rocks, if these are present. In coal mines, the possibility of gas and coal-dust explosions necessitate greater precautions against sources of ignition than are commonly considered necessary in metal mines. Coal mine fires may also originate in blown-out shots, defective or improperly assembled safety lamps, and use of open lights in gaseous parts of the mine.

In general, mine fires are started more frequently from ignition of timber, and are spread by advancing from timber to timber, than any other material. This is to be expected, since timber is the most common of combustible materials in underground mines, and a coal mine fire usually spreads by burning of timber rather than coal. Moreover, when a

crete and steel of the Brier Hill shaft, at Vulcan, Mich., are excellent illustrations of fireproof construction. A number of iron mines at Ironwood, Mich., have steel headframes, concrete engine houses and concrete change houses.

Considerable progress has been made in recent years, not only in shaft surface construction of fireproof material but of fireproof construction of mine and mill buildings. Among the various types of fireproof or semi-fireproof buildings are (1) reinforced concrete, (2) steel frame and walls of brick, cement plaster, or reinforced concrete, (3) timber frame work with sheet-iron sides and roof.

Undoubtedly, wooden buildings about the mine mouth are a fire hazard, as attested by a number of appalling fires in mines from this cause. Wherever practicable, surface buildings should be built of non-inflammable material. If wooden buildings are constructed, they should be at least 100 feet from the mine entrance.

Wooden buildings, where these are in use, should preferably be protected by covering the walls with some fireproof material, such as cement plaster, gunite, or with sheet metal. If nothing better can be afforded, painting wooden buildings will afford some slight protection from incipient fire, although the primary purpose of using paint and preservatives is to increase the life of the structures.

At mines where there are wooden buildings or structures near the mine mouth, the opening should be equipped with emergency doors of fireproof construction which can be shut in time of danger to prevent fire or smoke entering the mine.

All buildings near the mine mouth, whether fireproof or not, should be kept free from inflammable materials as far as practicable and amply supplied with fire-fighting equipment, such as water pipes, sprinkling system, chemical extinguishers, and fire hose, carefully tested from time to time to insure that they are in good working order.

SHAFTS AND SHAFT STATIONS

The best and safest type of shaft construction, as regards permanence and freedom from fire hazards, is undoubtedly the concrete-lined shaft, except in some localities, as at certain deep metal mines, where heavy pressures are encountered, accompanied by movement of the strata, which prevents the successful use of concrete.

The first shaft in the United States to be lined with concrete is said to be at Tug River, W. Va., in 1903. In the past 20 years, concrete, reinforced by steel, has come into wider use for shaft construction in many of the larger coal mines of Pennsylvania, West Virginia, and the Central Bituminous District, in iron mines of the Lake Superior District,

and elsewhere. The first cost of such a shaft is high, since it is usually necessary to timber substantially in order to protect the men in sinking the shaft and to prevent caving before the concrete has been placed and has set. The concrete lining usually is 12 to 20 inches thick in most concrete shafts, although in favorable ground it may be less. However, in most mining districts of the East, the increasing cost of timber and the difficulty of getting timbers of shaft dimensions without shipping them in, frequently several hundred miles, makes new timbered shafts less desirable in the end, not only from point of fire hazard but also economy, for mines that will be operated for a long period of years.

Precast concrete slabs and steel sets have been used in some shafts of the Lake Superior District. Precast concrete linings are also installed in some of the airway upcast shafts at Butte.

While reinforced concrete or solid concrete is the most desirable shaft construction, the cost limits the use to the larger mines. There are many mines which cannot afford to install concrete shafts, as the shafts are timbered and will serve the probable life of the mine by repairing as needed. Also in some deep mines, as at Butte, movement of the ground under heavy pressure has precluded the successful use of concrete as a shaft lining.

In timbered shafts, guniting or coating with cement is the most feasible means for fireproofing shaft timbers. The gunite is applied by spraying a mixture of cement and sand through the nozzle of the "cement gun" by means of compressed air. There are various methods of reinforcing gunite, by chicken wire, expanded metal wire, metal lath, as well as applying it directly to the mine timber or the mine wall. Where gunite is applied to mine timbers, it is customary to cover the timber with wire mesh before coating. In shafts, gunite may also be applied on wood lath or metal lath.

The Anaconda Copper Mining Company has gunited 13 timbered shafts in its mines at Butte and thus decidedly lessened the fire hazard. Most of these shafts have three hoisting compartments and a pump compartment, and are timbered with 12 by 12-inch fir sets lagged with 2-inch plank. The Tramway main hoisting shaft was gunited in 1917. The shaft was thoroughly overhauled and the timbers put in the best practicable repair. This has been a difficult shaft to maintain, since displacement through subsidence and heavy pressure had necessitated constant realignment of the timbers. The gunite was applied on metal lath nailed over the timbers. One set of the shaft lagging was removed, above and below each shaft station, and a concrete fire seal made. A similar seal was provided at the rear of each shaft sta-

tion. The method was then extended to other shafts. It is described in detail by E. M. Norris in a recent article in *Compressed Air Magazine*.

SHAFT STATIONS

In shaft stations, underground pump stations and hoist rooms, the supports should preferably be of steel or reinforced concrete, and if in a coal mine, the entire station should have a non-inflammable lining, such as concrete, gunite, or sheet iron. A common construction seen in shaft stations at mines with concrete shafts is concrete arching in that part of the shaft station nearest the shaft, while the rear part is supported with timber sets.

Preferably all downcast timbered shafts, and all timbered shaft stations, underground pump houses and engine rooms, should be coated with gunite, plaster cement, concrete slabs, or other non-inflammable coating. The value of guniting as a fireproofing material for coating mine timbers is second only to the use of all fireproof construction. There are numerous instances of the protective effect of gunite. During the past year, in a gunited shaft in a western mine, the power wires were short-circuited and the insulation burned through, igniting an exposed timber ladder which had been placed subsequent to the guniting. The ladder burned for a considerable distance, as well as the power wires, but the gunited timbers were entirely unaffected and the fire was extinguished with the minimum of expense and danger. Also, in a few instances, small fires have started in underground fan stations through burning out of the electric insulation, but these were easily extinguished and no serious danger resulted because the stations had been gunited. For small amounts of timbering, cement plaster applied by hand troweling over chicken wire is practicable and convenient.

HAULAGEWAYS

The use of steel sets and metal lagging is becoming common in coal mines, where conditions are usually more favorable to their use than in metal mines. In coal mines steel collars in some places are supported on hitches cut in the rib, in other places on metal legs, and in others on concrete piers. For lagging, old mine rails, corrugated iron, and sheet iron are used.

In timbered entries of coal mines and main drifts of metal mines, the fire hazard is greatly lessened by guniting the timbers.

While coating timbers with cement practically eliminates the fire hazards, if a sound thick coating is secured, the effect of such coatings on the resistance of wood to decay remains to be determined. When a dense, practically impervious coating has been obtained on

sound timbers, free, or practically free, from decay, it seems reasonable to believe that decay cannot proceed very far. However, cracking of the cement will admit air to the wood and permit decay. Furthermore, it is often difficult or impossible to cover the sides of timbers and lagging which are next to the walls and roof.

Examples have been noted by the writer where gunited timbers on which the cement coating had been broken or fractured, or had not covered the timber, were attacked by decay. It is recommended that timbers to be gunited should first be put in good state of repair, all sets in advanced state of decay should be renewed, and timbers showing slight decay should be carefully scraped to remove the decayed wood. The most permanent results would be secured by treating the timber with a preservative before guniting.

It is highly desirable that data be obtained by careful records over a period of years, on the life of timbers that have been gunited, in mines where guniting had been applied, in order that the effect of the gunite in retarding decay can be conclusively established. Mine operators who use gunite in their mines should carefully note the conditions of the timbers when the gunite is placed and make a record of the service obtained from these timbers as compared with uncovered timbers under similar conditions. The U. S. Forest Service and the Bureau of Mines are greatly interested in learning of instances where such records are being kept and in having progress reports on the observations. In this way a mass of useful data can be built up which will yield useful information to the industry.

REDUCING THE FIRE HAZARD OF EXPOSED TIMBERS

Timbered shafts which are not fireproofed by lining with concrete slabs, plastered concrete, or gunite, should be provided with a water line equipped with suitable sprays, perforations, or fusible plugs, and valves at suitable intervals, so that the timbers can be quickly and thoroughly drenched. Shaft stations and other critical points in the mine should be provided with fire-fighting equipment, such as water line and fire hose, chemical fire extinguishers, and sand boxes. In applying water to shafts that are upcast, care must be taken that it does not reverse the ventilating current with loss of life. The valves in water lines should be tested at frequent intervals to insure that the water is available when needed.

Electric wiring in shafts should be thoroughly insulated, and preferably the part containing the wires should be fireproofed so that in event of the insulation becoming damaged the timber will be protected from electric sparks or current. Some mines having timbered shafts have made use of drill holes through which the power wires are carried into the mine, thus obviating any need for having them in the shaft.

In the mine, electric trolley or light wires should never be attached in contact with timbers but should always be properly insulated at points of contact. Underground fan stations, motor stations, or other places where stationary electrical machinery is installed, should

to fire. Wood that has been impregnated by these salts does not ignite readily, and if exposed to flame, chars but does not blaze, and if the flame is removed, the treated wood ceases to burn. It is necessary that the wood be thoroughly impregnated, because the treated surface of a stick with shallow impregnation might char through, then the untreated wood will burn.

While the treating of wood to render it fireproof is commercially practiced in the building industries, thus far the method has not found application in mines. There is great need for a cheap preservative for treating mine timbers to prevent their taking fire. If a suitable method could be evolved whereby the timber could be made both fire resistant and resistant to decay, it would very likely find a wide application in the mining industry.

Some slight protection from fire is afforded by whitewashing mine timbers, and there are a number of proprietary paints or compounds on the market that are said to be suited to the purpose.

Decaying timber, if it is not wet, is readily ignited by sparks from any source. Sound timber, especially when peeled, does not catch fire so easily. Therefore, the use of preservatives, by

keeping the timber sound, will reduce the fire hazard. Coal tar creosote and zinc chloride are most commonly used for treating mine timber.

There is no better preservative than coal tar creosote, but sometimes the objection is raised to its use in mines on account of its supposed fire hazard. Creosoted timber has been used in a number of mines with excellent results, and, so far as known, no fires have been caused by its use. While the relative inflammability of creosoted to untreated timber is an unsettled question, the evidence indicates that creosoted wood, after it has seasoned several months, is somewhat more difficult to ignite than untreated wood. Freshly creosoted timber, however, can be easily ignited and should be kept from sources of fire, such as burning matches, burning cigarette stubs, and locomotive sparks, as the fresh oil on the timber will burn freely, if ignited. If the timber is permitted to season a few months before use, the more volatile part of the oil evaporates, and the fire hazard becomes about the same or less than that of untreated timber. It is recommended, therefore, that mine timbers which have been creosoted should be stacked in open piles and "dried" a few months before use. Untreated tim-



U. S. Bureau of Mines Photograph

A Typical Timber Yard at a Western Metal Mine

be made fireproof, if timbering is present, by concrete, or other fireproof lining.

Inflammable materials, such as explosives, fuse, oil, grease, gasoline, fodder, and bedding for animals, should not be stored in the vicinity of timbers, and refuse, such as oily waste, paper, manure and empty powder boxes, should be removed from the mine and never stored in abandoned places, as they may start a fire by spontaneous combustion.

In metal mine stopes, candles were formerly a prolific source of fires. The carbide lamp, now almost universally used in metal mines, is much less of a fire hazard. The carbide lamp should not be hung or placed where the flame might ignite timber, and spent carbide should not be dumped near timber. While the most important cause of fire in stopes is open lights, fires have also started from dropping burning tobacco or matches on chips and shavings below, blasting too near timbers, dropping lighted paper down chutes to see whether the ore is all withdrawn, and thawing dynamite.

TREATMENT WITH CHEMICALS

There are a number of chemicals, including ammonium phosphate, ammonium sulphate, and borax, with which wood can be treated to make it more resistant

ber, after it begins to decay, will catch and hold fire more readily than creosoted timber which has seasoned.

Creosote fumes are objectionable to some men, causing headache and nausea, also with some men hot vapors from heated creosote or handling freshly treated wood affects the skin like sunburn. However, such incidents are few, and any men who are sensitive to creosote should be transferred to other work.

Zinc chloride is cheap, clean, and without odor. According to the U. S. Forest Products Laboratory, timber treated with zinc chloride does not ignite so readily as untreated wood, although it cannot be considered an effective fireproofing material. Since zinc chloride is being used in a number of mines with good results, and in view of the fact that zinc-treated timber is widely used in the railroad, telephone, and telegraph industries with satisfactory results where the ties and poles are exposed to severe leaching conditions conducive to decay, it seems evi-

dent that mine operators can use zinc chloride without fear that mine waters will leach out the zinc chloride and thus destroy the efficacy of the treatment. In view of the above properties, timber treated with zinc chloride can be used with confidence by those who are averse to placing creosoted timber in their mines.

Sodium fluoride has been used quite extensively in Europe for treating mine timbers, and in some mines of this country. Timber treated with sodium fluoride is said to be less inflammable than untreated timber. While the writer does not know of any authoritative evidence on this point, it is certain that its use could not increase the fire hazard.

None of these three standard preservatives for mine timbers can be regarded as fireproofing agents, and in mines where treated timber is used, the same precautions should be taken to prevent fire as in places where untreated timber is installed.

CALCIUM ARSENATE

Large Deposits Of Calcite In The South Make Economical Manufacture Of Calcium Arsenate Comparatively Simple

NOTWITHSTANDING the reports reappearing from time to time that the boll weevil is disappearing, and that frost or weather conditions will ultimately solve the problem, it is recognized that of all remedants yet developed the dusting of calcium arsenate is more nearly satisfactory than any other; and that the onward march of the insect pest is such as to require treatment for many years.

With a view to meeting this emergency, and to reduce the cost of the dusting powder to the cotton grower, Mr. K. L. Kithil, a consulting mining engineer of Denver, Colorado, has devoted much attention to the problem and has evolved some interesting results.

Mr. Kithil predicates his computations on the use of chemical lime at \$10.00 per ton. It is known that any high grade limestone running 85 percent CaCO_3 or better, is available for the purpose. Large deposits of calcite and other limestone in the cotton growing states of the South, make the manufacture of calcium arsenate therefore unusually suitable for consideration.

The principal source of the white arsenate, As_2O_3 , to date, has been the metal mines of the West. The extraction of arsenic from arsenical pyrites is receiving special attention in Alabama, and it is hoped to present an article on this in an early number of the MINING CONGRESS JOURNAL.

Mr. Kithil advocates the development of arseno-gold ores, and by means of con-

centration and calcining such ores under recovery of both arsenic and gold values, to produce at a good profit the raw arsenic for the manufacture of calcium arsenate.

This, or the complete calcium arsenate, could be cheaply shipped via the Panama Canal to some southern port. The business is a seasonal one, but if a contract could be arranged at a fixed price for a period of at least five years, on a continuous production basis, with proper storage, a lower and stable price could be obtained.

According to Mr. Kithil's studies, if the gold content of the ore averages \$4.00 per ton or better, and the white arsenic (As_2O_3) is not less than 5 percent, such ores will permit of profitable operation, on the basis of 12 to 25 tons of calcium arsenate per day, to sell at 7 cents a pound f. o. b. works.

There are many such gold-arsenic properties in the States of Washington, Oregon, Montana and California. The California properties, however, are especially suitable on account of their significant location.

If we assumed an ore carrying 0.2 ounces gold and 8 percent As_2O_3 , and an 85 percent recovery of values, the value would be about \$11.00 per ton. The estimated cost of mining, concentration and reduction to white arsenic, and gold recovery, Mr. Kithil estimates at \$4.00 for mining, \$2 for concentration, and \$2 per ton of concentrate for arsenic and gold recovery. This is based on low grade

ores and does not consider pockets of rich arseno-pyrite which are frequently encountered and which require no preliminary concentration.

The price of calcium arsenate during the past year has fluctuated from 9 to 14½ cents per pound, the average market being 11 cents per pound. Mr. Kithil estimates the production cost at 7 cents and a contract sales price for a period of five years at 9 cents per pound, thus stabilizing the market and assisting at the same time in the development of the gold industry. Coincident with a daily production of arsenic sufficient for 30 tons of calcium arsenate, or 9,000 tons per year, there would be recovered \$130,000 of gold. With calcite at \$10 per ton, giving a production cost of 7 cents per manufactured pound of calcium arsenate, the profit on 9,000 tons at 2 cents per pound would yield \$360,000.

To achieve this, the estimated outlay would be:

Concentrating mill.....	\$125,000.00
Roasting furnaces and arsenic kitchens.....	20,000.00
Calcium arsenate and acid plant.....	125,000.00
Mines equipment and development.....	50,000.00
Working capital.....	250,000.00

Total capital required.... \$570,000.00

Of this total capital of \$570,000, \$490,000 would represent the net profit the first year after reaching full capacity.

The proposition as outlined by Mr. Kithil is one which might well appeal to a cooperative group in the South for the production of their arsenic in the West, and the utilization of their limestone deposits for the building up of another industry, essential to their own development.

ASPHALT AND RELATED BITUMENS IN 1923

BOTH the quantity and the value of asphalt and related bitumens produced in the United States increased in 1923, according to a statement issued by the Geological Survey.

The sales by producers were as follows: Native asphalt and related bitumens, 400,236 short tons, valued at \$2,885,631; asphalt made from domestic petroleum, 995,654 short tons, valued at \$13,060,174; asphalt made from Mexican petroleum, 1,378,722 short tons, valued at \$16,840,045.

The imports of ozokerite and other mineral waxes were 4,856,357 pounds, valued at \$213,407, a decrease of more than 40 percent in both quantity and value from the imports in 1922. The exports of unmanufactured asphalt were 72,628 short tons, valued at \$1,500,869, an increase in both quantity and value. The exports of manufactured products were valued at \$1,154,976.

STANDARDIZATION OF MINING EXCAVATING EQUIPMENT

Advantages Of Standardized Excavating Equipment Discussed By A Manufacturer Of That Equipment—Uniform Sizes And Types Endorsed

FROM the manufacturer's point of view standardization of excavating equipment should ultimately accomplish a reduction in the number of machines now being built for mining service, and through greater concentration of thought and effort, make those machines more efficient and applicable for the work they are intended to do. To make such a plan mutually beneficial to builder and user alike it must accomplish three things: First, to establish the practicability of certain designs and types of machines for specific kinds of work; Second, to determine a correct range of sizes to provide maximum coverage of work with minimum number of machines; Third, through engineering research and experience, and through actual performance of equipment in the field, to prove certain fundamental facts relating to varied design in order to remove as far as possible questions of doubt in the mind of the buyer.

UNIFORM SIZES AND TYPES FOR SIMILAR WORK

Although it will never be possible for all operations to use identical equipment, yet it is admittedly feasible and practical to establish a uniformity of power shovel sizes for similar work. Working ranges and operating conditions being equal, or nearly so, desired output calculated in cubic yards can easily be the principal governing element in determining the size of machine. The type of excavator must, of course, vary with the topography and character of the operation; the manner in which the material is to be dug, whether it be from above or in brenches against a bank; the desire for versatility, etc. These varying elements quite naturally cause changes in equipment, yet there is a certain similarity in all mining operations and it is really surprising what a large range of variable work can be accomplished with only a few sizes and types of well designed, high class, versatile machines.

In a number of

By HARVEY T. GRACELY *

mines the excavating units are not in proper balance with the treatment plant or the transportation facilities. Sometimes the loading facilities are quite inadequate, which means cars, locomotives, equipment and men idle at intervals, or working leisurely, thus adding an intangible item of cost that can only be eliminated by improved or increased loading facilities.

Occasionally the loading equipment has greater capacity than actually required for the normal output of the mine. This reserve capacity is much to be preferred, as compared with insufficient shovel equipment, for it is far more economical to have the shovel idle at intervals than for the transportation system to be disorganized and the plant running only to partial capacity.

Many large mines have been developed from smaller ones, where smaller loading equipment was quite efficient, but due to plant expansion the shovel later proved to be out of balance with the other units. In the replacement of such equipment the manufacturer can usually be of much help to the mine operator, for the output of shovels under certain conditions is known, or can easily be determined. Most prominent manufacturers have reliable performance data which is not released for general distribution but is always available in the interests of the industry.

PRACTICAL RANGE OF SIZES IN RAILWAY AND REVOLVING TYPES

A careful study of conditions at some

of the more efficiently operated mines would doubtless show that shovel equipment can be standardized to three or four sizes in railway type shovels and two or three sizes in the full revolving type.

Without attempting here to set forth the principal advantages of railway and revolving shovels, it might be briefly stated that railway shovels can be used advantageously wherever dipper capacities of 2½ to 5 cubic yards are required, or where the material to be handled is exceptionally hard. The 4 and 5 cubic yard shovels have proven to be particularly well adapted for mine work and it is predicted they will always remain as the most prominent machines for this class of service.

The usefulness of railway type shovels has been greatly augmented by the introduction of crawler trucks. These trucks eliminate all working track, rails, ties and jack blocks and reduce the crew three or four men. As output can be substantially increased, and operating costs proportionately reduced, by the use of these trucks it is quite certain they should be included as one of the standard features for railway type shovels.

Where working requirements exceed the limit of ability of railway type shovels the large revolving type can be advantageously employed. It is not necessary nor expedient to build these larger shovels in more than one or two sizes for they are used only on the larger operations and they can be readily adapted to a wide range of working conditions. The same elements of standardization can apply as are appropriate for the railway models, with the possible

exception of crawler trucks for the larger sizes. The smaller revolving shovels are more universally employed for general utility work. And there is plenty of such work about the average mine, building roads, loading and unloading plant materials, reclaiming by-products, excavating for buildings, bridges, etc. Shovels of this type are now standardized to a high degree and they can be had in varying sizes from



Electric Shovel Working in Ore Pit on the Mesaba Iron Range

* Marion Steam Shovel Co., Marion, Ohio.

three-fourth cubic yard to 2 cubic yards dipper capacity. Preferably these shovels can be had with crawler trucks but most sizes can be had with standard or narrow gauge wheels for movement on the mine tracks.

UNIFORM DESIGN

The desire for standardization on the part of the mine operator should not be predicated on the idea that manufacturers will ever get together and adopt exactly the same way of building their respective machines. This would destroy initiative, result in inaction and be contrary to modern competitive methods. A manufacturer's designs, and his initiative to create better and more efficient machines, are his stock-in-trade, upon which he can rightfully capitalize for the future enlargement of his business.

But it is possible to harmonize designs, and it is entirely ethical for the buyer to ask for the standardization of such features as are proven by experience to be more efficient and practical than others. For instance some manufacturers contend that alternating current is best adapted for power shovel operation while others have found from actual experience, under a wide range of varying conditions, that direct current is more efficient. The mine operator will ultimately make the decision from his own cost sheets and as soon as the most efficient kind of current is determined it should immediately be adopted as the standard design. And so it is with other features; dippers can be graded to exact uniform dimensions, working dimensions of similar sized shovels can be made to correspond, accessories and attachments can be more clearly defined, and many other things can be done to carry out the idea of standardization and make it operate to the advantage of builder and user alike.

It will never be possible to standardize placer mining dredges to the same degree as power shovels for there are many varying elements to be taken into consideration when designing a floating machine. Yet this can be accomplished to some extent and definite progress will quite likely follow the present effort in effecting a standardization of power shovels.

When everyone interested once understands the multitude of benefits to be derived from practical standardization of mining excavating equipment more rapid progress will likely occur. Added co-operation will follow as soon as the soundness of the plan is fully understood by those whom it affects.

The American Mining Congress should feel proud to have sponsored such a noteworthy and worth-while proposition. The task is tremendously large but results can surely be obtained that will be fully proportionate to the effort expended.

MINING AND INDUSTRIAL ELECTRIC LOCOMOTIVES

THE Department of Commerce announces quarterly data on shipments of mining and industrial electric locomotives, collected from nine firms, comprising the entire industry. Below is

shown a summary of shipments, by classes, for the quarter ending June 30, 1924, with a comparison for the quarter ending March 31, 1924. Totals are also given for the year 1923.

SHIPMENTS OF ELECTRIC LOCOMOTIVES				
Type of locomotive	Quarter ending June 30, 1924		Quarter ending March 31, 1924	
	No. shipped	Value	No. shipped	Value
Mining locomotives:				
Trolley type	98	\$486,493	112	\$554,950
Storage-battery type	36	162,353	28	128,615
Total	134	\$648,846	140	\$683,565
Industrial locomotives:				
Trolley or third-rail type	9	\$150,112	19	\$147,139
Storage-battery type	12	69,714	26	143,892
Total	21	\$219,826	45	\$291,031
SHIPMENTS OF ELECTRIC LOCOMOTIVES, TOTAL FOR 1923				
Type of locomotive	No. shipped		Value	
Mining locomotives:				
Trolley type	1,024		\$4,628,981	
Storage-battery type	249		1,291,885	
Total	1,273		\$5,920,866	
Industrial locomotives:				
Trolley or third-rail type	10		\$ 60,942	
Storage-battery type	51		239,362	
Total	61		\$ 300,304	

NATIONAL ELECTRICAL CODE APPROVED

THE Regulations for Electric Wiring and Apparatus in Relation to Fire Hazard, of the National Fire Protection Association, generally known as the "National Electrical Code," 1923 edition, have been approved by the American Engineering Standards Committee.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of THE MINING CONGRESS JOURNAL, published monthly at Washington, D. C., for October 1, 1924.

City of Washington,
District of Columbia, ss.:

Before me, a Notary Public, in and for the state and county aforesaid, personally appeared R. S. Mowatt, who, having been duly sworn according to law, deposes and says that she is the assistant business manager of the MINING CONGRESS JOURNAL, and that the following is, to the best of her knowledge and belief, a true statement of the ownership, circulation, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reserve side of this form, to wit:

1. That the names and addresses of the publisher, editor, and business managers are:

Name of Publisher—The American Mining Congress.

Postoffice address—Washington, D. C. Editor, J. F. Callbreath, Managing Editor, E. R. Coombes. Business Manager, E. C. Porter.

2. That the owners are (give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 percent or more of the total amount of stock): The American Mining Congress—a corporation, not for profit. No stockholders. H. W. Seaman, pres., 111 W. Jackson Blvd., Chicago, Ill. Daniel B. Wentz, first vice-pres., Land Title Bldg., Philadelphia, Pa. E. L. Doheny, second vice-pres., Securities Bldg., Los Angeles, Calif. L. S. Cates, third vice-pres., care of Utah Copper Co., Salt Lake City, Utah. J. F. Callbreath, secretary, 841 Munsey Bldg., Washington, D. C.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are (if there are none, so state): None.

R. S. MOWATT,
Assistant Business Manager.

Sworn to and subscribed before me this 22nd day of September, 1924.

(Seal)

F. T. STEPHENSON.

(My commission expires May 14, 1926.)

Service means many things

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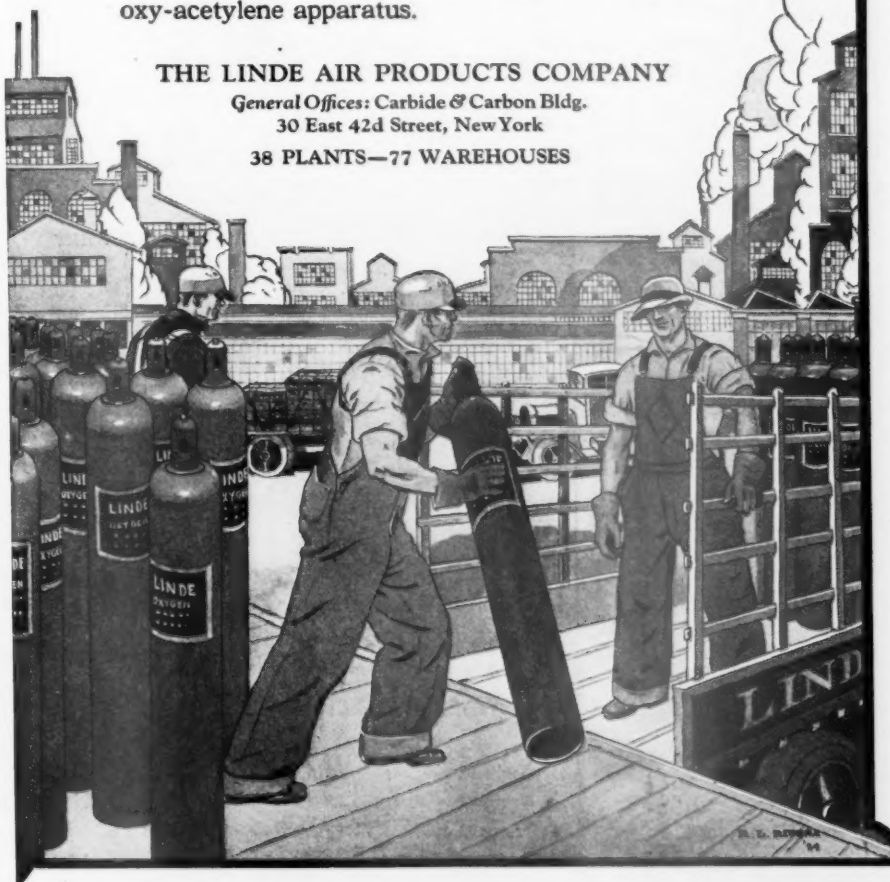
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Pa.

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Morse Chain Co., Ithaca, N. Y.

CHAINS, COAL CUTTING

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48th Pl., Chicago, Ill.

CHAINS, DRIVE

Allis-Chalmers Mfg. Co., Milwau-
kee, Wis.

CHAINS, FRONT END

Morse Chain Co., Ithaca, N. Y.

CHAINS, OILING

Morse Chain Co., Ithaca, N. Y.

CHAINS, POWER TRANS- MISSION

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Columbus, O.

Morse Chain Co., Ithaca, N. Y.

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CHAINS, SLING

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Ohio Brass Co., Mansfield, Ohio.

CLUTCHES

Connellsville Mfg. & Mine Supply
Co., Connellsville, Pa.

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Bldg., Philadelphia, Pa.

Lehigh Coal & Navigation Co.,
Philadelphia, Pa.

Thorne, Neale & Co., Philadelphia,
Pa.

Bertha-Consumers Company, Cham-
ber of Commerce Bldg., Pitts-
burgh, Pa.

COAL CRUSHERS

Connellsville Mfg. & Mine Supply
Co., Connellsville, Pa.

Jeffrey Mfg. Co., 958 N. Fourth St.,
Columbus, Ohio.

COAL CUTTERS

Goodman Mfg. Co., Halsted St. and
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Ingersoll-Rand Co., 11 Broadway,
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Jeffrey Mfg. Co., 958 N. Fourth St.,
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Lidgerwood Mfg. Co., 96 Liberty
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COAL MINING MACHIN- ERY

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Ingersoll-Rand Co., 11 Broadway,
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Jeffrey Mfg. Co., 958 N. Fourth St.,
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Jeffrey Mfg. Co., 958 N. Fourth St.,
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Ingersoll-Rand Co., 11 Broadway,
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COMPRESSORS, MINE CAR

Ingersoll-Rand Co., 11 Broadway,
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Allentown, Pa.

CONCENTRATORS (Table)

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kee, Wis.

CONCRETE REINFORCE- MENT

American Steel & Wire Co., Chi-
cago and New York

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kee, Wis.

Ingersoll-Rand Co., 11 Broadway,
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48th Place, Chicago, Ill.

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Traylor Engineering & Mfg. Co.,
Allentown, Pa.

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CONVEYORS, CHAIN FLIGHT

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Lidgerwood Mfg. Co., 96 Liberty
St., New York City.

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kee, Wis.

Jeffrey Mfg. Co., 958 N. Fourth St.,
Columbus, Ohio.

CONVEYORS, PAN OR APRON

Jeffrey Mfg. Co., 958 N. Fourth St.,
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CONVEYORS, SCREW

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Rolla, Mo.

Hoffman Bros., Punxsutawney, Pa.

CRUSHERS

Allis-Chalmers Mfg. Co., Milwau-
kee, Wis.

Gruendler Patent Crusher and Pul-
verizer Co., 942 North 1st St.,
St. Louis, Mo.

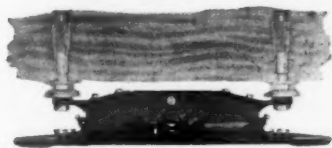
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CRUSHERS, COAL

Connellsville Mfg. & Mine Supply
Co., Connellsville, Pa.

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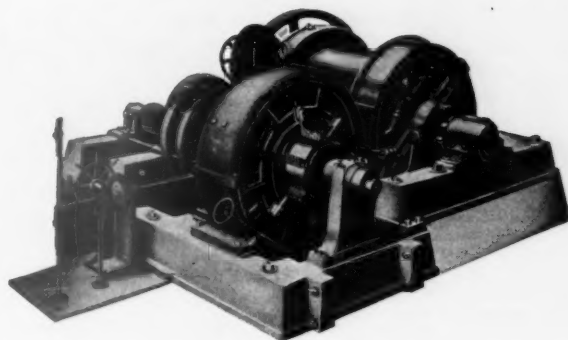
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 Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

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DRILLS, PNEUMATIC

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 Ingersoll Rand Co., 11 Broadway, New York City.
 New York Engineering Co., 2 Rector St., New York City.

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Traylor Engineering & Mfg. Co., Allentown, Pa.

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 Hercules Powder Co., 934 King St., Wilmington, Del.

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 Goodman Mfg. Co., Forty-eighth Place and Halsted St., Chicago, Ill.

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 General Electric Co., Schenectady, N. Y.

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ELECTRIC HOISTING MACHINERY

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 Ohio Brass Co., Mansfield, Ohio.

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ELECTRICAL SUPPLIES

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 Traylor Engineering & Mfg. Co., Allentown, Pa.

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Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

ENGINE TRIMMINGS

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ENGINEERING APPLIANCES

The Lunkenheimer Co., Cincinnati, Ohio.

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Lidgerwood Mfg. Co., 96 Liberty St., New York City.

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 Ingersoll Rand Co., 11 Broadway, New York City.

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 Ingersoll Rand Co., 11 Broadway, New York City.

ENGINES, STEAM

Allis-Chalmers Mfg. Co., Milwaukee, Wis.
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 Hunt, Robert Company, Insurance Exchange, Chicago, Ill.
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 Hercules Powder Co., 934 King St., Wilmington, Del.

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 Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

FEEDERS, ORE

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 Traylor Engineering & Mfg. Co., Allentown, Pa.

FLOTATION MACHINES

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

FLOTATION OILS

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FLOW METERS

General Electric Co., Schenectady, N. Y.

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FURNACES

(Reverberatory)

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 Traylor Engineering & Mfg. Co., Allentown, Pa.

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Wolf Safety Lamp Co. of America, Inc., 220 Tanne Place, Brooklyn, N. Y.

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 Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

LOADING MACHINES

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 Jeffrey Mfg. Co., 958 N. 4th St., Columbus, O.

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 Goodman Mfg. Co., Halsted St. and 48th Pl., Chicago, Ill.
 Jeffrey Mfg. Co., 958 N. Fourth St., Columbus, Ohio.

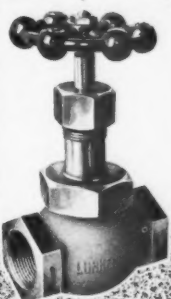
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Hercules Powder Co., Wilmington, Del.

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Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll Rand Co., 11 Broadway, New York City.

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Connellsville Mfg. & Mine Supply Co., Connellsville, Pa.
Ingersoll Rand Co., 11 Broadway, New York City.

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Ingersoll Rand Co., 11 Broadway, New York City.

PUMPS, POWER

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Ingersoll Rand Co., 11 Broadway, New York City.

PUMPS, SAND

Ingersoll Rand Co., 11 Broadway, New York City.

PUMPS, STEAM

Ingersoll Rand Co., 11 Broadway, New York City.

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Ohio Brass Co., Mansfield, Ohio.

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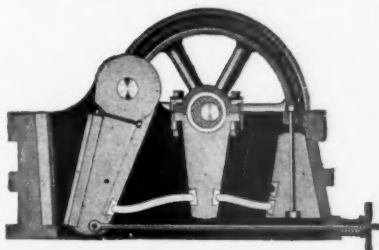
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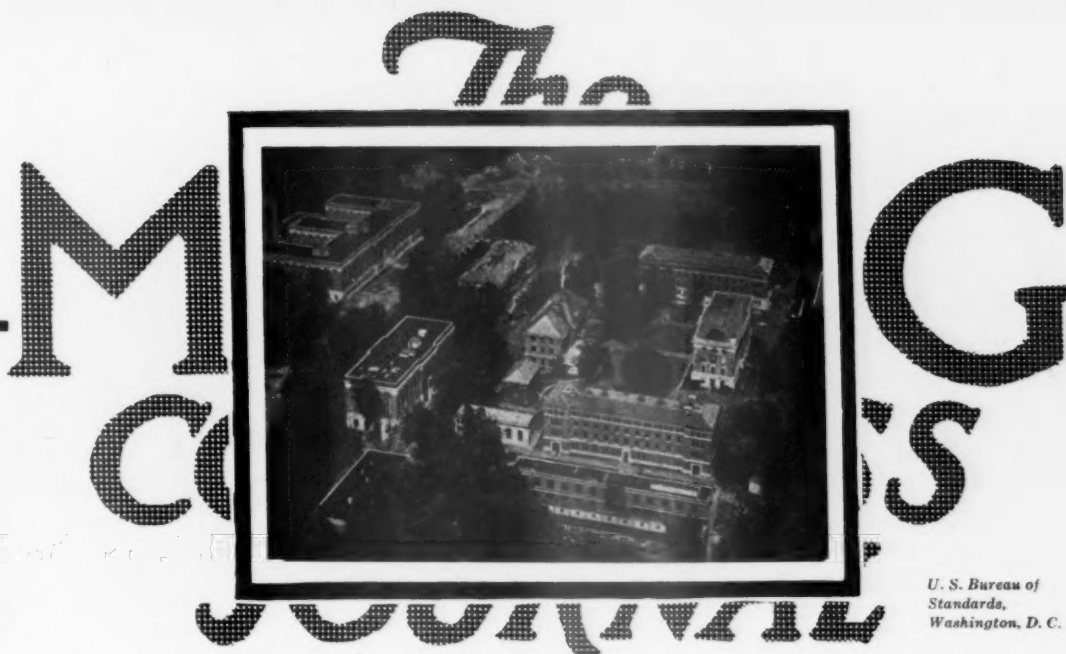
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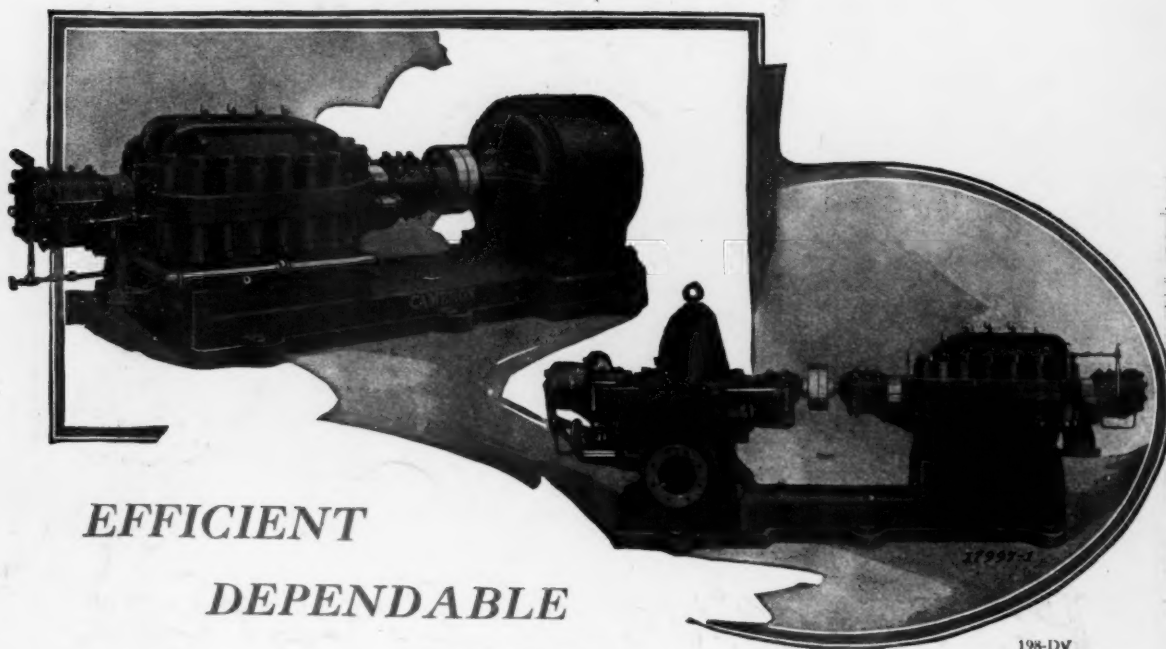
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